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ABSTRACT

This notebook was developed in response to the concern for energy conservation. It contains activities that stress an energy conservation ethic and includes many values clarification activities for grades K-2. The teacher is provided with some background information on energy, an extensive revised teacher's annotated bibliography, and a list of resources. The topic of energy is divided into concepts and objectives, with activities interspersed where appropriate. There are over 40 pages of ditto and transparency masters, two posters, and a game for the teacher's use. Also included is an evaluation sheet for the teacher to assess the activity packet. (Author)

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ED204182

ENERGY

Conservation Activity Packet

K–2

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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ENERGY CONSERVATION ACTIVITY PACKETS

Ruth Bakke
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INTRODUCTION TO ENERGY PACKETS

The energy shortages and emergencies with which we are faced attest the treatment humans have given to their natural surroundings. Not only do we experience personal inconveniences, but we also see severe economic and environmental consequences. Our nation has arrived at a time when it needs to reevaluate where it is going, at what speed, and how it will eventually arrive at that goal. The National Academy of Sciences generally agrees that the reserves and resources of domestic oil, gas and coal will satisfy energy needs in the United States until the year 2000. Presently the United States doubles its energy consumption every 13 years. In 1975, electric companies burned 507 million barrels of oil to generate electricity, 500 million barrels were burned to heat factories. Much of the oil and natural gas consumed could be replaced by coal, thus drastically reducing oil imports.

The instructional program in a school can examine this energy situation with reason and logic. When a social issue is integrated into the total curriculum, it helps children to apply what they are learning. The educational process can help students become aware of the alternatives and consequences in regard to energy, then guide them to choose a value. Students can learn that it is just as exciting to make something last as it is to develop something new.

Through use of the enclosed materials and activities, it is our intent to stress a conservation ethic. The conservation ethic means more than turning lights off; it has wider implications such as developing new industries to recycle metals, making more durable products, and prioritizing fuel uses.

Our values show what we tend to do with our limited time and energy. They are related to the experiences that shape them. In order to help children develop clearer values, teachers must help them use the process of valuing.

Choosing	(1)	freely
	(2)	from alternatives
	(3)	after thoughtful consideration of the consequences of each alternative
Prizing	(4)	being happy with the choice
	(5)	willing to publicly affirm the choice
Acting	(6)	doing something with the choice
	(7)	repeatedly, incorporating in some pattern of life

Students become much more purposeful when they have been given opportunities to clarify their values.

Each packet contains values clarification exercises designed to carry out the stated objectives. The teacher may wish to use a specific model to

develop more exercises. You will find that the valuing process is another tool for the teacher. When used, it leads children from apathy and confusion toward positive learning and life-styles.

The goal of providing the types of activities, which have been included, is to create a growing awareness for the need of dealing with existing energy problems in a positive way. Individual teachers should select objectives which they feel reflect the needs of a particular class. Each packet contains an energy goal and an awareness or accommodation objective. It is imperative to include objectives from each conceptual area as the purpose of these packets is to develop an energy conservation ethic within the students of today that they may become conserving and concerned citizens of tomorrow. Changes may not occur immediately due to home and parental values; however, as they become adults, this learning will show its effects.

Each packet includes many activities for the teaching towards the stated objectives. Teachers need choose only those activities which they feel will accomplish their objectives. As there are often many activities suggested for an objective, the teacher may choose to prepare and offer multiple activities. This could allow students to choose the activity they find most interesting. The teaching of energy and its conservation is designed to be interdisciplinary in order that students see that energy cannot be isolated from our daily lives. This is also important in developing the conservation ethic.

Within the packet, teachers will find transparencies, posters, filmstrips, etc. which may add to the teaching of energy and development of conservation. (These supplementary sheets are grouped together at the end of the notebook behind the colored divider page.) These visual materials plus the activity sheets can be adapted for many uses beyond those suggested, even though a variety of presentation methods is inherent in the notebooks. For example, class, small group, individual, and even family activities are included. In fact, each packet has at least one student interest center or learning station sheets included in the supplementary sheet section. Suggestions and criticisms from teachers, consultants, etc. would be appreciated and considered in keeping these packets suitable for the majority of school systems.

Most young children (7-11) years are in the concrete operational stage as named by Piaget. Such students consider real, concrete things in a systematic, but not abstract manner. Therefore, the activities which have been proposed reflect this and provide for greater awareness, rather than a formal study of energy. Individual teachers know their students best and will need to select items which they feel will be of greatest benefit to the education of the children. This is also the reason the concepts and objectives for the primary grades (K-2) have been combined in one packet. There are some classroom activities which require about 20 minutes each, some 40 minutes, and there are also some activities which can be done at home in order to enable children to work with their families.

AN OVERVIEW OF THE CONCEPTUAL DEVELOPMENT OF
K-6 ENERGY PACKETS AT A GLANCE

ENERGY GOALS

K-2 The learner becomes aware that all living things require energy.

The student becomes aware of sources of energy within the learner's home and school.

The learner becomes aware of uses of energy.

Grade 3 The learner develops an understanding of how energy affects our lives. (Packet A, Goal 1.00)

The learner examines the available energy sources. (Packet B, Goal 1.00)

Grade 4 The learner becomes aware that energy can be changed from one form to another - conversion. (Packet A, Goal 1.00)

The learner considers energy, its production, use, and conservation as essential in the maintenance of our society as we know it. (Packet B, Goal 1.00)

Grade 5 The learner develops an understanding of fossil fuels and uses. (Packet A, Goal 1.00)

The learner recognizes the involvement of energy in Iowa's past, present, and future. (Packet B, Goal 1.00)

Grade 6 The learner recognizes limits of energy sources. (Packet A, Goal 1.00)

The learner develops an understanding of alternative sources of energy. (Packet B, Goal 1.00)

Personal Awareness or Accommodation Goal

All packets focus on encouraging the development of a conservation ethic. The Personal Awareness or Accomodation Goals are "Goal 4.00" in the white K-2 notebook and "Goal 2.00" in both packets, A and B, within the 3, 4, 5 and 6 grade level notebooks. Activities in this section encourage students to question the personal importance and implications of that which has been experienced. They utilize the values clarification approach described by Raths, Harmin, and Simon in Values and Teaching.

TEACHER BACKGROUND MATERIAL

Energy is required to move the car on the street, move a person, or move a piece of machinery. Energy is found in many forms other than mechanical. There is heat energy, electrical, chemical, potential, and kinetic energy. The connection comes when we realize that with one form we may store energy, with another we are transforming energy, and with another we are perhaps able to transport energy from one place to another. An average person in the United States today uses as much energy as 25 people in some other countries. For air conditioning alone, Americans use as much energy as 800 million Chinese people use for everything.[1]

Almost all of the energy used in the United States (more than 95%) comes from the burning of fossil fuels--coal, oil, and natural gas. Petroleum, or crude oil, is the most important of the fossil fuels because it is not only used as a fuel but also as an ingredient in making new products, such as packaging, nylon, and fertilizers.

Daily the earth receives a total of 13.9×10^{21} Btu of solar energy; however, the earth does not have sufficient technology to store most of the sun's energy. A big "next step" in utilizing solar energy is to locate an inexpensive means of converting the solar energy into a useful energy.

Today we hear so much about energy. It is important to us because we use it each day in many different forms. Energy cannot be seen but we can see what it does. The young children will have heard the term, energy, used in a variety of ways--certain things give them lots of energy and they may feel full of energy. For your purposes, a simple definition will suffice, such as, energy makes things go.

Primary children need experiences in simple activities through which they become aware of what energy is and that things can be done to conserve energy. They can become exposed to this complex topic through establishing a connection with ways they use energy in their everyday lives. Emphasis is also given to involving parents and families in the learning process.

[1] Intercom, Sept. 1973, p. 14. "The Energy Question: Problems and Alternatives" by William A. Nesbitt.

CONCEPTS AND OBJECTIVES IN ENERGY EDUCATION

Primary K-2

Energy

1.00 The learner becomes aware that all living things require energy.

1.1 Discovers why their bodies need energy.

1.2 Recognizes that movement requires energy.

1.3 Becomes aware that energy exists in many forms.

1.4 Becomes aware of the vital role of energy in their lives.

2.00 The student becomes aware of sources of energy within the learner's home and school.

2.1 Becomes aware of uses of electricity in the home.

2.2 Becomes aware of how electricity is used in the school.

2.3 Examines how dependent we are on petroleum (fossil fuels) and electricity.

3.00 The learner becomes aware of the uses of energy.

3.1 Becomes aware of ways in which different energy sources may be used.

3.2 Becomes aware of the importance of energy conservation.

3.3 Becomes aware of the sun as a source of all energy (fossil fuel).

Personal Awareness

4.00 The learner will become aware of energy conservation.

4.1 Recognizes that something can be done to conserve energy.

4.2 Becomes aware that the learner can do something to conserve energy.

4.3 Develops an appreciation and value for energy.

4.4 Develops an appreciation for the role of energy in their world of play, transportation, school, and at home.

4.5 Begins to make some value decisions affecting their use of energy.

4.6 Develops an appreciation for their need to contribute to an energy conservation ethic.

ENERGY ACTIVITIES
Primary K-2

1.00 The learner becomes aware that all living things require energy.

Discovers Why Their Bodies Need Energy

1.1, 1.2 The children lift or push several objects in the classroom (books, chalk, chairs, etc.). Help them recognize that work was being done and energy was provided by their muscles.

a. How do your muscles get energy?

b. Perhaps show a filmstrip which portrays, simply, how the body uses food to produce energy.

1.1 Take a walk on a nice day and have the children notice movement. Keep a list. When the class returns to the room, discuss what caused each movement they saw. They could then draw pictures of what they observed.

1.1 Let pupils participate in a series of physical exercises such as walking, hopping, skipping, jogging, running a certain distance. Then ask the children to determine which method of movement required the most energy and why.

1.1 Bring boxes of cereal for display. Ask the children why they eat cereal in the morning. Ask if other foods give them energy. Discuss that the body changes food into energy it can use. Have the children locate pictures of food or people eating food and pictures of things people can do with the energy they get from food. Glue these on paper, the food on one side, the activity on the other, to show the relationship.

1.1 Discuss with the children why it is important to eat the right kinds of food each day. Have the children draw pictures of balanced meals.

a. The children can demonstrate what they would feel like without the proper kinds of food.

b. Discuss, or demonstrate, what they could not do if they did not eat correctly.

c. Prepare healthful snacks or plan a nutritious lunch or breakfast. The class could invite parents to a breakfast they have prepared.

1.1 Ask the children where the milk they drink comes from. Discuss, show pictures, if necessary, then use the transparency (*Transparency #1*)

1.1 Make a bulletin board with the title "Where We Get Our Energy." As items are added, the class discusses them. Another bulletin board could be entitled "Energy Eaters" and show what items use energy.

Movement Requires Energy

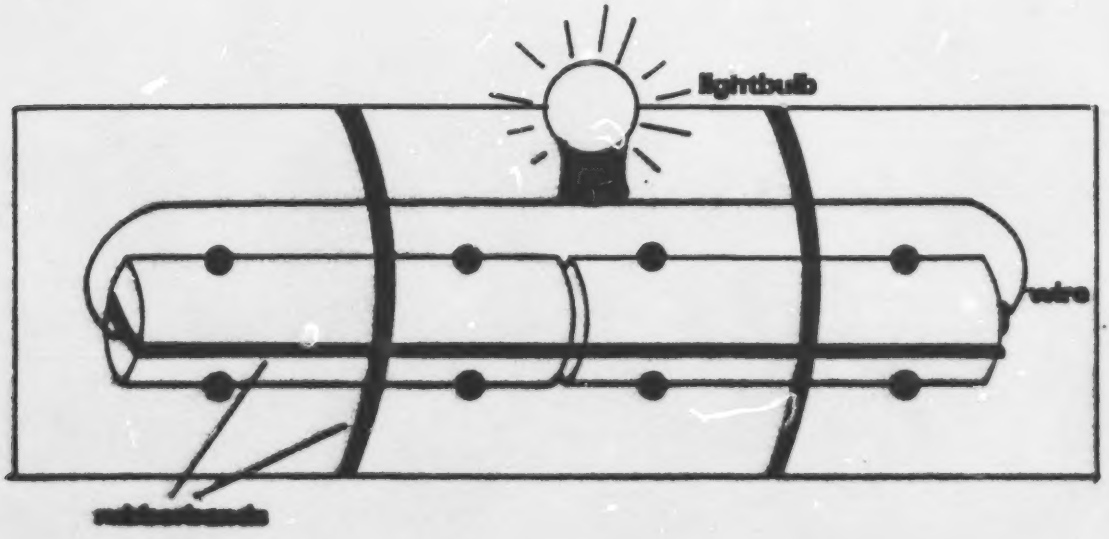
1.2 Play "Simon Says" for a short period of time. Students name some of the actions while the teacher records these on the chalkboard or a chart. Determine which movement required the most work. Guide the children to see that movement is a form of energy.

1.2 Bring materials for making a cake. Put the ingredients in the bowl, and ask the children how to mix it. Let children help with the hand mixing, then finish with a beater. Discuss energy and then ask what needs to be done next. Discuss the source of energy that makes the stove work. Bake the cake, frost the cake if desired, eat, and Enjoy! (*Transparency #2*)

1.2 Energy Coloring Book (*Masters #1-5*)
These pages show that energy is everywhere and help the children understand this idea. Discuss with the children developing this concept. Ask if the pictures show ways they actually use energy. Have the children color the pictures.

Energy Exists in Many Forms

1.3 The teacher demonstrates lighting of a light bulb with batteries and talks about electricity as a form of energy. The children could then list other things that use electricity.



Materials: 3 rubber bands
2 flashlight batteries
8 nails
2 pieces of wire (spliced bare at ends)
1 small light bulb
1 small piece of wood

Assembly:
1. Batteries may be seated between two rows of nails on a piece of wood.

2. Rubber bands may be used to hold the wires to the contact ends of the batteries and to keep the batteries securely seated between the nails on the wood base.

3. When the circuit is closed, as above, the light bulb will glow.

1.3 Hit a nail into a board with a hammer or pull one out. Touch the nail. What does it feel like? Compare it with a nail which has not been pounded in. Sand a board with sandpaper. Feel the board. What happened? Establish that hitting the nail, pulling it out, and sanding the board involve movement (body energy) and produce heat energy.

1.3 Each child brings from home a few pictures from magazines, etc. that show work being done by machines or people. Discuss and display.

1.3 Classify magazine pictures into categories of "Energy" and "Non-Energy." The teacher could develop this as a class activity, a small group activity, or as a self-checking activity for individuals.

1.3 Construct a paper pinwheel and use as a means of helping children become more aware of types of energy. Ask the children what causes the windmill to turn and what it could be used for. (*Master #6*)

1.3 Credit: My Energy...is Your Energy, Arizona Department of Education, 1974. Pop popcorn and talk about energy--how it is present in the kernel and is released. There is water in each kernel of corn which, when heated, converts to steam. The kernel expands and pushes against the tough skin of the kernel. Soon the kernel explodes and you can see the white starch of the inside kernel. Then you and your students can eat the experiment (food energy). Note the conversion of butter from solid to liquid form when subjected to heat energy.

1.3 Stand a safe distance in front of a fan to feel the force of the air. Observe the energy of the wind through the use

of pinwheels, balloons, kites, bubbles, a paper sailboat, paddleboat. Put hands under the faucet to feel the force of the water. Let the children talk about the kinds of energy they experience.

Vital Role of Energy in Our Lives

1.4 Energy Inventory Sheet (*Sheet #1*)
Talk about each picture. The children circle each picture that shows a way in which they use energy. (The blank space may be used by the children to show other ways they use energy.) Ask them if they use a lot of energy and how important energy is in their lives.

1.4 Take the children on a walk through the school. Make certain the class has talked about energy and uses the definition "energy makes things go." Stop in several rooms and ask the children where they can find energy being used in each room. Upon returning to the classroom, use the Survey Sheet #2 so the class can compile information before beginning their drawings about the energy walk. The children can then draw pictures of where they saw different forms of energy being used. (*Survey Sheet #2*)

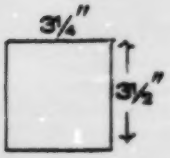
1.4 Establish an independent activity station using the "Magic Box." Use pictures from Learning Station #1, 2 and glue these to pieces of tagboard. At each station, the child makes a decision regarding the picture, puts the picture card in the magic box, and receives the correct answer. Learning Station #1--the child examines pictures of different types of energy, and decides if the action uses his energy, the sun's energy, or electricity, and places the picture in the magic box for the answer. Learning Station #2--the child examines pictures of people wasting energy and people conserving energy, then decides which is happening, and places the picture in the magic box for the answer.

How to Make a Magic Energy Box

Materials: box with a cover (we recommend shoe boxes)
tagboard
tape
bright, attractive contact paper
cutting tool (razor blade, sharp scissors)

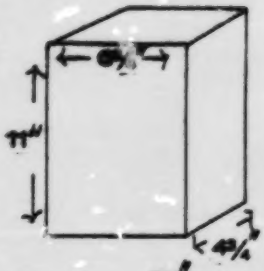
1. Decide on the approximate size of task cards. Cut from tagboard. One side will contain a picture from Learning Station #1 or 2. The reverse side will contain the answer.

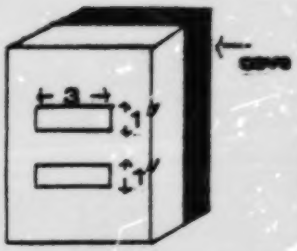
i.e.



2. Select an appropriate size box. Consider the depth of the box--deeper is generally better.

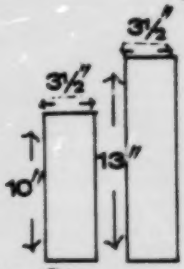
3. On the bottom of the box, cut 2 slots, 1" long and 1/8 of an inch wider than your task card. Slots should be cut so that their sides are parallel and centered one above the other at opposite ends of the box.

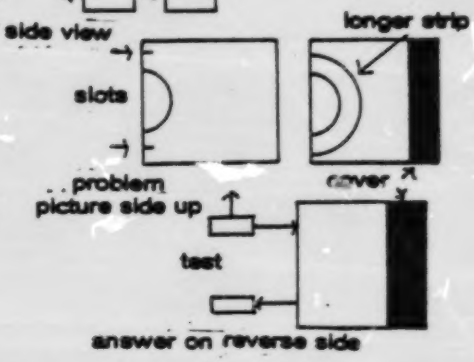




4. Cut 2 strips of tagboard with width of the slots. Make one strip about 3" longer than the other.

5. These strips will form a path for your task cards. Attach the small strip with tape to the lower edge of the upper slot, and the upper edge of the lower slot. Attach longer strip to upper edge of upper slot and lower edge of lower slot. Test your path by inserting task card problem side up in the upper slot. (You may have to adjust the strips if the task card does not insert easily and return smoothly.) Return cover to box.





6. Now cover box with contact paper, etc. for an attractive magic box.

Please Note: Any size box may be transformed into a magic box.

1.4 Show pictures which provide examples of energy existing in many forms (chemical, mechanical, heat, light, food), examples of where energy comes from (coal, natural gas, oil, geothermal, wind, sun), and examples of how energy is a part of their lives (cars, TV, etc.).

1.4 Write an experience chart story of what the children have learned about energy and energy conservation.

1.4 Growing activity--plants, seeds, etc. Children plant seeds and watch and record what happens. Help the children keep a chart (very basic one).

4.00 THE FOLLOWING AWARENESS ACTIVITIES ARE CORRELATED WITH THE ABOVE CONCEPTS. The learner will become aware of energy conservation.

<u>Something Can Be Done to Conserve Energy</u>

4.1 In order to help children grasp an understanding of the term "conservation," show a lollipop, popsicle, or a

piece of hard candy. Ask what would happen if you took bites. Ask if there would be a way to eat it that would make it last longer. Then use the term "conservation" and relate it to energy.

4.1, 4.2 Make "I Can Conserve Energy" booklets, depicting energy in use around the home and at school, or methods of preventing its waste.

4.1, 4.2 Construct mobiles "Ways We Can Conserve Energy." Use coat hangers, yarn, pictures either drawn by the students or colored ditto drawings on how we can save energy (i.e. turn off light, ride bike, close door in winter, keep refrigerator door closed, don't let faucet drip, etc.).

4.2 Talk with children about what they do on a Sunday afternoon at home. Discuss whether these activities require much energy. What activities require little energy? Have the students draw pictures of what they can do on a Sunday afternoon at home which would not require a lot of energy.

4.2, 4.6 Teacher obtains a copy of Only Silly People Waste, by Norah Smaridge (Abingdon: Memphis, Tennessee, 1976, $4.25) and reads to the children. These are silly poems that introduce the importance of conserving energy and materials.

4.2, 4.5
4.6 Voting

The teacher uses the following questions, or similar ones, to help children begin the process of making value decisions. The children respond to each question by raising or not raising their hands. Discuss whatever seems to be of most interest to them at the moment, in regard to energy.

How many of you...

1. _____would like to eat whatever you want?
2. _____have many toys with motors or batteries?
3. _____like to color or read a book instead of watch T.V.?
4. _____have your parents take you in the car wherever you need to go?
5. _____have discussed with your family ways to conserve energy?

Appreciation and Value for Energy

4.3, 4.4 Set up a class chart of helpers. Include a "lights-out" helper or an "energy saver."

4.3, 4.4 Discuss ways in which the class could conserve (don't waste paper, turn out lights when not needed). Make a list or chart and post in the room. Student drawings could dress it up.

4.3, 4.4 The teacher sends home copies of *Master #7* which contain questions the children can use in a discussion with their families.

a. Encourage children to find out how their families are conserving.

b. Class discussion where children can report back on things they found out at home.

4.3, 4.4 The teacher sends home copies of *Master #8* for the family to work on together. Children could be encouraged to return these or talk about them.

4.3, 4.4 Pass out drawing paper for an art lesson (related to energy or not) and tell them they will not be allowed any more paper. If they make a mistake, they will just have to include the mistake in the drawing or art work.

4.3, 4.4 Tell the class you do not have enough paper towels to last until the next shipment comes in. Ask them what can be done to solve this problem. Then tell them there are only 5 more sticks of clay for the rest of the year. What can they do in a situation like this? Introduce the word conservation and talk about conservation of supplies in the room. What do you do with the scraps? At the end of the day, check the trash can to see if there are things which could be used another way (recycled).

2.00 The student becomes aware of sources of energy within the learner's home and school.

Uses of Electricity in the Home

2.1, 2.5 In one day, keep track of each time you use electricity. List the purpose for each use of electricity. (*Student Survey Sheet #3*) Send it home on a weekend with a note to the parents explaining what the students are doing. Ask that these be returned on Monday.

2.1, 4.3 Determine the different uses of energy in your home and rank them from highest to lowest use. Compare lists and discuss what this shows about your life-style (the way you live). (*Student Survey Sheet #4*)

NOTE: Do the numbering of the ranking at school, only if the students seem able.

This, too, could be sent home on a week end and returned on the following Monday. A note of explanation should be included.

2.1, 2.2 Make a display of items that are powered by electricity for classroom use. Allow time for children to observe and ask questions. Ask them to decide which of the items could be eliminated and what they would use instead of that item.

2.1, 2.3, 4.3 Credit: Living Within Our Means: Energy and Scarcity, Environmental Education Instructional Activities, K-6, The University of the State of New York, The State Education Department, Activity 5, p. 32.

Show children a picture of people sitting around a campfire (*Picture #1*). Ask what the main uses of the heat of the campfire are. Children will probably say to cook and to keep warm. Ask children how many different things they think they have in their houses to perform the two basic functions of cooking and heating. Their guesses will probably cover a broad range. Give children old magazines and department store brochures advertising housewares and appliances. Have them cut out everything they can find that helps people use heat energy. After many pictures have been collected, recall the campfire, and ask what fuel was used to provide the energy needed for most of the items in the pictures. Start a bulletin board display titled "How We Use Heat Energy in Our Homes." Set up columns for the different fuels suggested by the children: natural gas, gasoline, oil, wood, charcoal. Attach the pictures to the appropriate columns. Or simply display pictures collage fashion:

a. What are the advantages and disadvantages of using a campfire for cooking and for keeping warm?

b. Which column on the bulletin board has the most pictures?

c. How many of the jobs done by the appliances shown on the bulletin board could have been achieved without using an appliance at all?

d. Why do Americans use all of these different items?

e. What do you suppose is happening to our supplies of fuel?

Uses of Electricity in the School

2.2 Invite the school custodian into the classroom and let him explain how he uses electricity to help him in his work in the school. He could also explain how his work would be different without electricity. What has he done to help the school save electricity? Ask him to help the children plan ways they can save electricity or other energy in their classroom.

2.1, 2.2 With the help of parents and teacher, students look at the wattage on light bulbs, read the figures, add them up and compare home consumption with classroom consumption. Can they think of reasons for a difference? What are things they could do to save on the amount of electricity they use with lighting? Someone from the utility company could be invited to help provide suggestions for saving with lighting.

2.2 The children could take an "Energy Walk" through the school. (See 1.4 in the Primary K-2 packet.)

2.2 Credit: Project I-C-E, 1927 Main Street, Green Bay, Wisconsin 54301.

Students bring to class pictures of their home and family, as well as catalogs and magazines. The students go through the catalogs and magazines cutting out pictures of things that need electricity and putting these pictures into two groups: Those their families need and those "extras" that they want. Discuss with the students the idea of necessities (needs) and luxuries (wants). After classifying the pictures the students should choose the electrical items they can't do without. Use the pictures to make a collage or mobile.

2.2 Energy Coloring Book (*Masters #9-12*)
These pages develop the idea that energy does many things. Discuss the concepts as the children work through the book.

Dependence on Petroleum and Electricity

2.3 Traffic Survey (*Sheet #5*)
This should be done during school time. Locate a busy intersection and with survey sheets and pencils in hand,

chart the number and kinds of traffic. Also record the time. This could be done at two different time periods. When back in the classroom, compare the survey sheets. Then, using *Master #13* (use *Master 13A* if you live in a larger city), have each child graph the numbers they collected on their sheets. Discuss freely, as to amount of gas for so many vehicles, car pools, mass transportation, etc.

2.3 Credit: The Energy Book, South Carolina Department of Education, Columbia, South Carolina 29201.

Ask the children to bring in pictures from magazines and/or to draw pictures of things such as houses, automobiles, boats, refrigerators, TV sets--things that they believe they would like to own or have available for their use when they are as old as their parents. Assemble the pictures and/or drawings in a large collage. Discuss the extent to which their "good life" depends on petroleum, electricity, etc. Should "old folks" be saving gasoline and electricity now so that plenty will be available for use 25 years from now? Why or why not?

2.3 Show *Transparency #3* and *#4* to help children understand what is behind the story of electricity. An upper grade class may be asked to help develop a steam generator to share with the children.

4.00 THE FOLLOWING AWARENESS ACTIVITIES ARE CORRELATED WITH CONCEPT 2.00. The learner will become aware of energy conservation.

Something Can Be Done to Conserve Energy

4.1 Credit: Energy Conservation: Experiments You Can Do, Thomas A. Edison Foundation, 1974. See experiment sheet #1, How does insulation work? and #2, How do storm windows work?

4.1 Demonstrate our energy problem using a bowl which contains pebbles and pieces of candy. Tell the children that the candy represents energy like oil, coal, natural gas, etc. Ask what happens when they use up the energy. (Let them eat some of the candy.) They will begin to dig for more just as we are doing now. The children then can suggest ways to conserve energy.

4.1, 4.2, 4.3 Make an energy conservation bulletin board. Children collect articles, pictures, cartoons to show ways to save energy. Discuss as they bring them in.

4.2, 4.3 Each week select two students to serve as energy savers. They would be responsible for turning off lights, checking or reading the thermostat, raising or lowering blinds, etc.

4.3 Energyland Game (*Gameboard #1*)
Source: Science and Children, November/December 1976, pp. 18-20.
This allows for review of energy terms and provides an opportunity to think about the things which have been discussed.

4.3 Send home with the children copies of *Master #14*. Arrange for feedback during the week as to the types of family discussions about energy which were held and what the families have decided to do.

4.3, 4.6 Voting--Values Clarification Activity

The teacher uses the following questions, or similar ones, to help children begin the process of making value decisions. The children respond to each question by raising or not raising their hands. Discuss if the class seems receptive.

How many of you...

1. _____ have more than five toys that have a motor or run on batteries?
2. _____ like to watch TV in your spare time?
3. _____ help turn off lights at home when not in use?
4. _____ helped your parents make a list of ways you could conserve energy at home?
5. _____ walked more than you rode in the car this week?

4.3 Announce that drinking water is becoming scarce and we need to ration drinks of water to 3 drinks per day. Allow them only a short drink (teacher could count while they drink, etc.). Ask them ways they could get more water if they needed it. Allow them to use their imaginations.

3.00 The learner becomes aware of uses of energy.

Uses of Different Energy Sources

3.1 Have the students state 3 advantages and 3 disadvantages of each of the following electrical appliances:

*toothbrush	*air conditioner
*water heater	*television
*freezer	*stove
*space heater	*dishwasher

3.1 Display *Poster #1* showing ways different energy sources may be used. Discuss with the children. Have them look for examples on their way to school and in their homes. The class could then report back the next day.

3.1 The teacher or children make puppets for the story, "The Best Present of All," a reprint from Ranger Rick. A single free copy is available from the National Wildlife Federation, 1412 Sixteenth Street, N.W., Washington, D.C. The story can then be read or simplified and acted out.

3.1, 3.2, 4.6 Credit: Living Within Our Means: Energy and Scarcity, Environmental Education Instructional Activities, K-6, The University of the State of New York, The State Education Department.

Discuss with the children the idea of food as a source of fuel for our bodies. The similarities of fuel-use by people (food) and fuel-use by machines (gas, gasoline, oil) should be established. When they have identified basic sources of energy, several in the class might play the role of "energy inspectors." The "inspectors" would examine the classroom, school building, and the home to determine where and what kind of energy is used (electrical outlets, lights, radiators, furnaces, school buses, projectors, televisions). As an extended or continuing activity, have the children draw or collect pictures of energy-using devices in home or school.

a. Why is energy so important?

b. Are all of the energy-using devices really necessary?

c. If you could keep only five things in your home which use energy, which would you choose? Why?

Importance of Energy Conservation

3.2 Following a discussion about different types of energy, divide a 9"x12" piece of paper into three sections. In

each section, use pictures from magazines, etc. to show three ways wind (or water, or wood, etc.) is used as a source of energy. If magazine pictures are not available, the children could make drawings.

3.2 Students devise a booklet to determine how they use energy. The booklet would be composed of pictures showing ways in which they use energy. The pictures could be drawings, newspaper and magazine clippings, and photographs.

3.2 Make a simple windmill (four or five popsicle sticks with cardboard for paddler glued to the stick). Drive the windmill with a fan. Discuss how farmers used the wind at one time and what work the wind might do for us. It might also be helpful to invite a local farmer to explain to the children how a windmill was/is used, or if possible, visit a farm with an operating windmill.

3.2, 4.2 My Energy Book by Energy Ant, Federal Energy Administration. Send for copies at the following address:

Federal Energy Administration
12th and Pennsylvania Avenue
Washington, D.C. 20461
or
U.S. Government Printing Office
Washington, D.C. 20042

(Ask for "Energy Conservation and Resources" (SB-058).

3.2, 4.3 Make SAVE ENERGY badges. Discuss the need for doing something, then design the badges. The children can make a list of people they will give badges to.

Sun as a Source of Energy

3.3, 4.2, 4.3 Grow a garden using manures and compost and encourage rotation of crops to emphasize the importance of doing your part in overcoming the energy shortage. It takes extra energy to manufacture fertilizers. Discuss.

3.3 Demonstrate the sun's warmth. Use one thermometer in the sun and one in the shade to show temperature differences. This is a good exercise for learning to read a thermometer. This could also be done using a pan of water in the sun compared with the temperature of a pan of water in the shade. You could have two groups, each doing an experiment then sharing results.

3.3 Demonstrate how the sun provides light. Take children outdoors into sunlight, then into a windowless room without lights. Discuss the difference.

3.3 Demonstrate the bleaching power of the sun--arrange leaves, shells, rocks, etc. on colored paper and put in the sun for a few hours around noontime. Remove the items and discuss what the sun has done. The sun can make things change. Turn this lesson into an art project by outlining the shapes with seeds, beans, etc. or creating realistic drawings from the bleached shapes utilizing crayon and imagination.

3.3 Transparency #5. Show class the transparency and discuss how sunlight plays a role in producing fossil fuels (helps plants to grow, aids in their transformation into coal, oil, natural gas). Use the children's interest and knowledge of dinosaurs to relate how very long ago this change began and how as dinosaurs and plants died, and others grew and died on top of them, etc., this caused each layer to press down upon the others, thus changing plant matter into coal and likewise plants and animals in marine sediment changed into oil, and natural gas.

Make a terrarium with different colored layers representing layers of soil. Use black licorice or a shoelace to represent coal seams.

3.3 The class makes a bulletin board display showing ways the sun gives energy. The display could be limited to pictures, cut from magazines, etc. or could be a combination of pictures and drawings by the students.

3.3 Display *Poster #2*. Show *Transparency #6* which depicts the earth receiving energy from the sun and giving off heat. Children can discuss examples such as the sidewalks, roads, beaches, etc., on hot summer days. If this is done on a hot day the children can actually experience these things outdoors.

3.3 The students, or class, write poems which describe their feelings about the sun. Another poem could describe how they would feel if there were no sun. These would be excellent to share as a language arts activity.

3.3 The class could write a story about "The Day the Sun Disappeared." Depending upon the ability of the students, you may wish to have the story done either as an individual or group activity. Share the stories in a language arts experience.

3.3 Sing songs about the sun. Check the school's music books and discuss with the music teacher. The students could take a popular song such as "Old MacDonald" and write a song about the sun to that tune--this would be done as a class activity.

3.3 Show how the sun makes plants grow. Place one pot with a newly sprouted plant in a sunny window and another in a dark

closet. Check every few days and discuss. Don't forget to water the plants! Help the children keep a chart of their observations as this will aid discussion.

3.3, 4.2 Source: Energy Conservation: Experiments You Can Do, Thomas A. Edison Foundation, Inc., 1974, "Let the sun help heat your home." Use master from packet marked Experiment #3.

3.3, 4.2 Source: Living Within Our Means: Energy and Scarcity, Environmental Education Instructional Activities, K-6, The University of the State of New York, The State Education Department.

On a sunny day in the early spring, take a class into a room on the sunny (south) side of the building. Then go into a room on the shaded (north) side of the building. Ask the children if the air temperature felt different. Elicit that the first room felt warmer and the sun had warmed it. Ask which side of the school usually gets the most sun. If they cannot remember, take the class outside at different times on a sunny day. They will discover that the south side gets the most sun and the north gets less. Explain that the side facing the sun should have many large windows to take advantage of the sun's warmth, and that the opposite side of the building should have fewer windows. Then explain that curtains should be utilized to shut out the cold on a dark winter day or the sun on a hot summer's day. Encourage the children to plan and build several diorama "houses" which would utilize the sun's warmth for heating. Place the completed houses on the window ledge in a sunny room. Discuss with the children how the houses should be oriented. To test their hypothesis, several houses should have the large windows facing away from the sun. Small dishes of water placed in the houses could be checked for temperature change.

3.3 Discuss how hours of light influence things we do. Children may wish to role-play some of the activities done at times of specific amounts of light.

3.3 Discuss names of living things which depend directly on the sun for their energy. Draw pictures of them and make a display, or assign groups to draw specific pictures and assemble into booklet form.

3.3 Trace an item of food to its plant source. (i.e. meat-store-packing plant-farmer-pig-sun) Use the Food Chain Stamps, *Master #14*, for a better visual representation of this chain. The students are given a copy of the sheet, instructed to cut the stamps apart, and put them in order--either beginning with the product and tracing back to the source, or beginning with the source and tracing to the product.

4.00 THE FOLLOWING ACTIVITIES ARE CORRELATED WITH CONCEPT 3.00. The learner will become aware of energy conservation.

4.0 "Energy Box"
The children bring actual objects and/or pictures that relate to our shortages and our environment (pieces of wood, trash, vial of motor oil, gas tank cap, etc.). Use the box as a source for discussion for small groups, or for the entire class.

Something Can Be Done to Conserve Energy

4.1, 4.3 Conservation Checklist (*Sheet #7*)
Make enough copies for the children, distribute them, give the directions, and after completion, discuss what was marked and why.

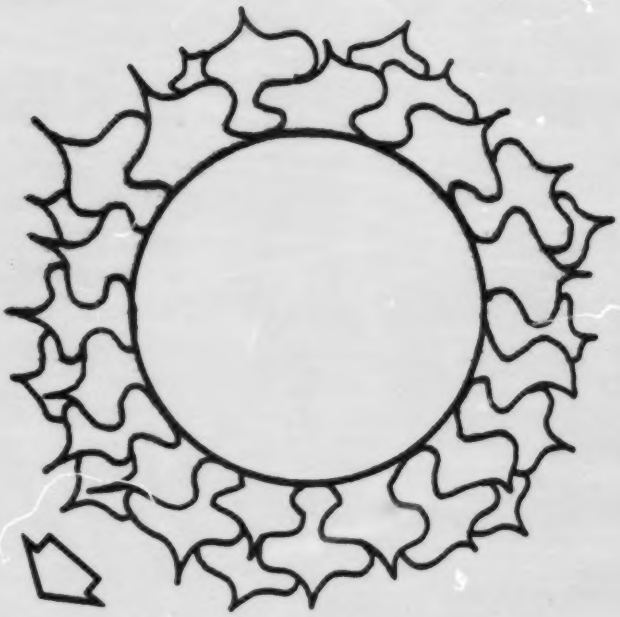
4.1, 4.2 Work to learn more about recycling. Contact waste disposal people, environmentalists, etc. to help children see how they can recycle to save energy. It takes less energy to make products from used or recycled materials. Does your community provide ways to help you recycle?

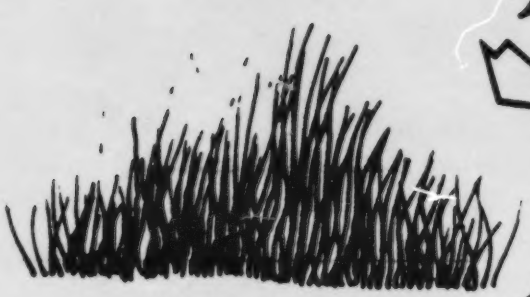
4.2, 4.3 Each week, after students decide which energy-saving method they want to emphasize, have them draw pictures and write stories about it. They can take these home to alert parents to the need to save energy.

Appreciation and Value for Energy

4.3 Send a letter home (*Master #15*) which contains questions the children can use in a discussion with their families about energy.

MILK GIVES ME ENERGY





cake
mix

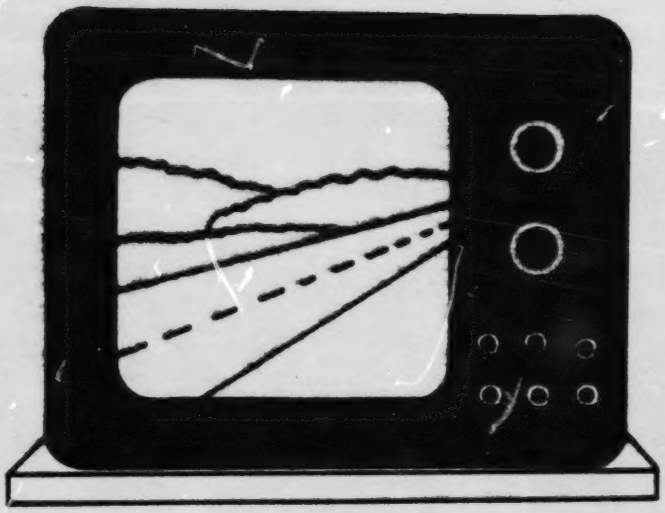
PEOPLE

USE

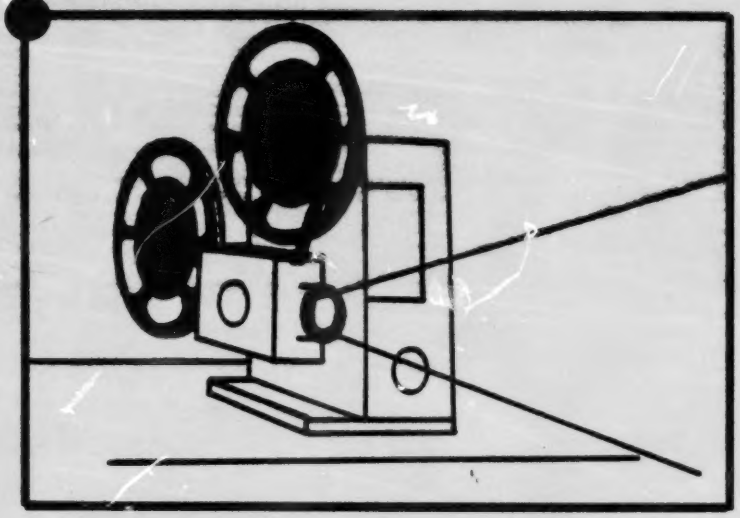
Energy

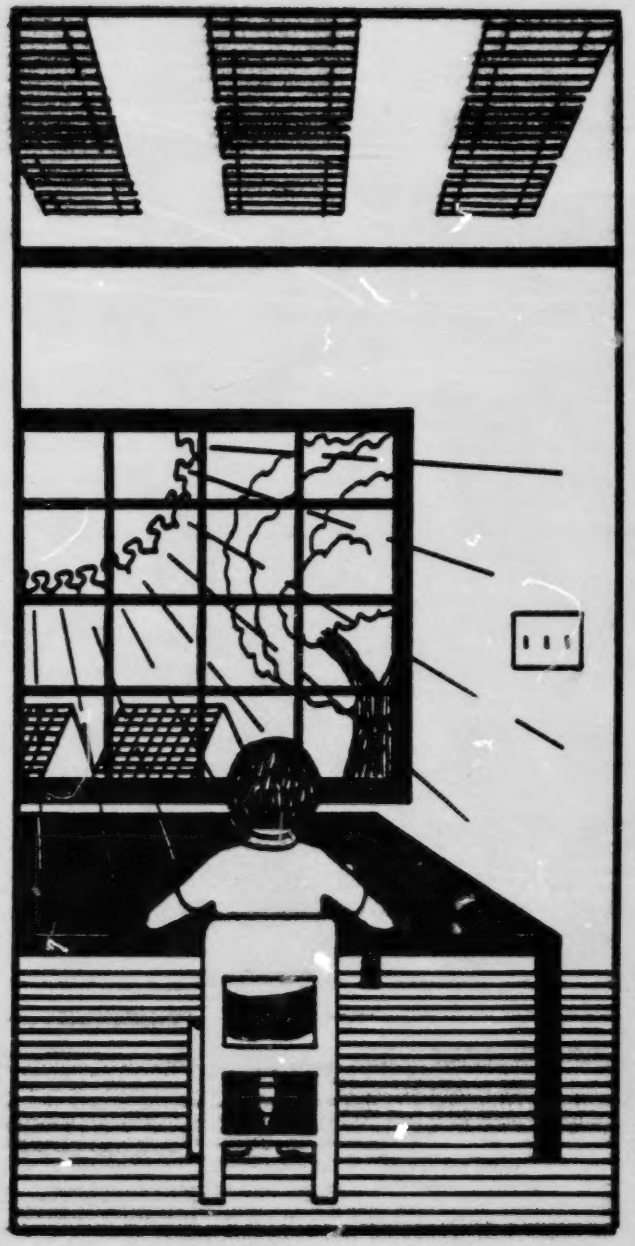
EVERYWHERE

HOME

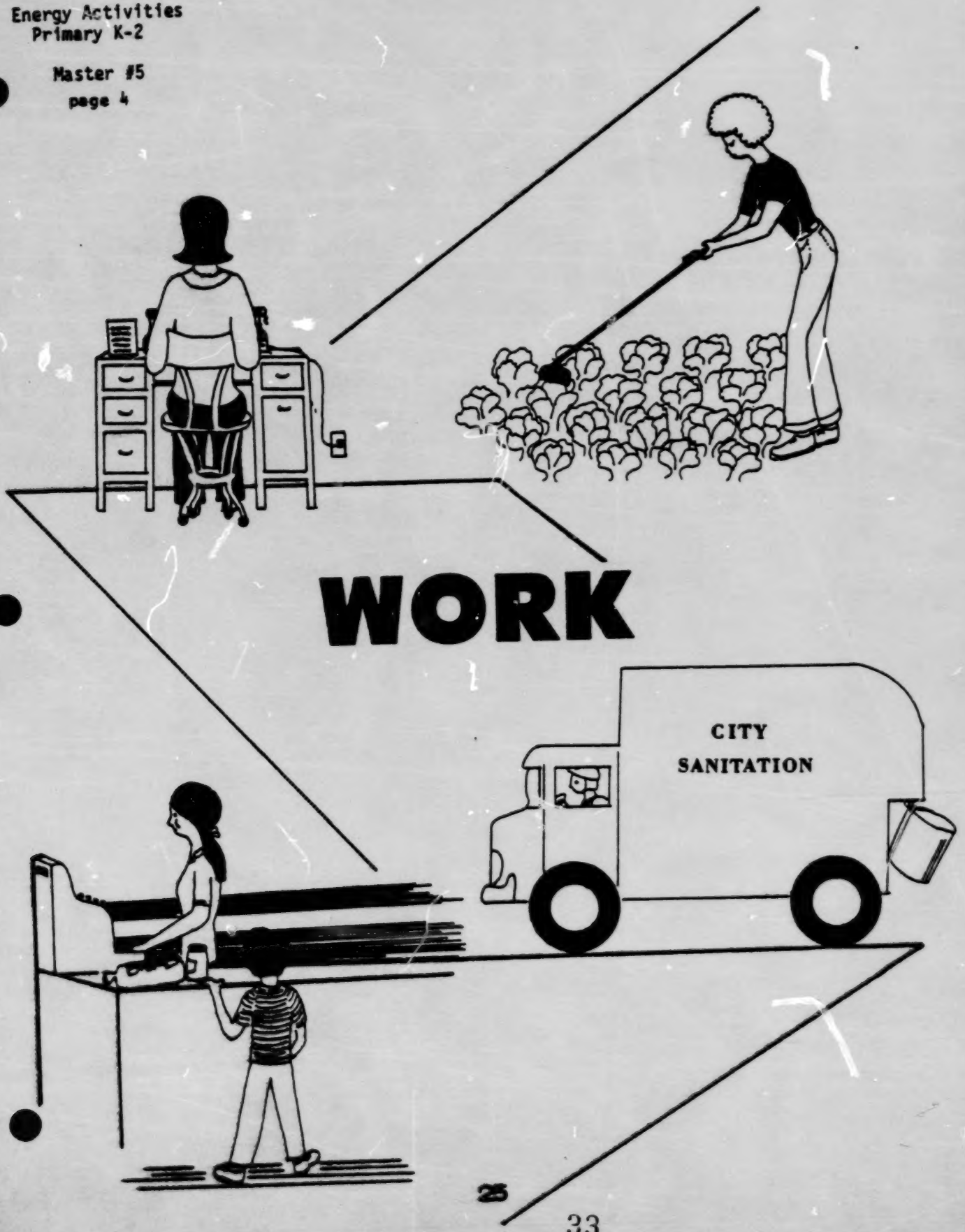


PLAY

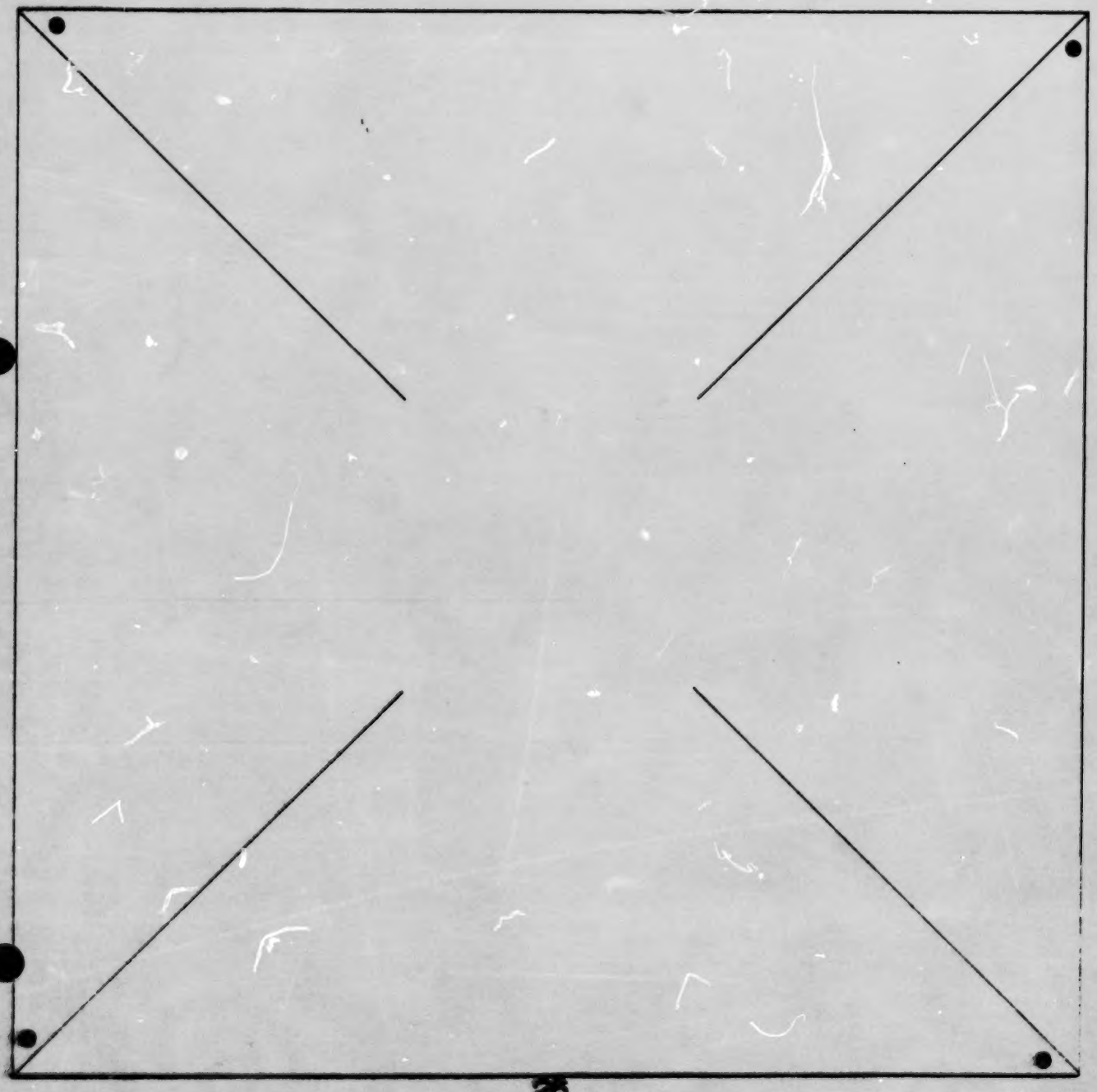




SCHOOL

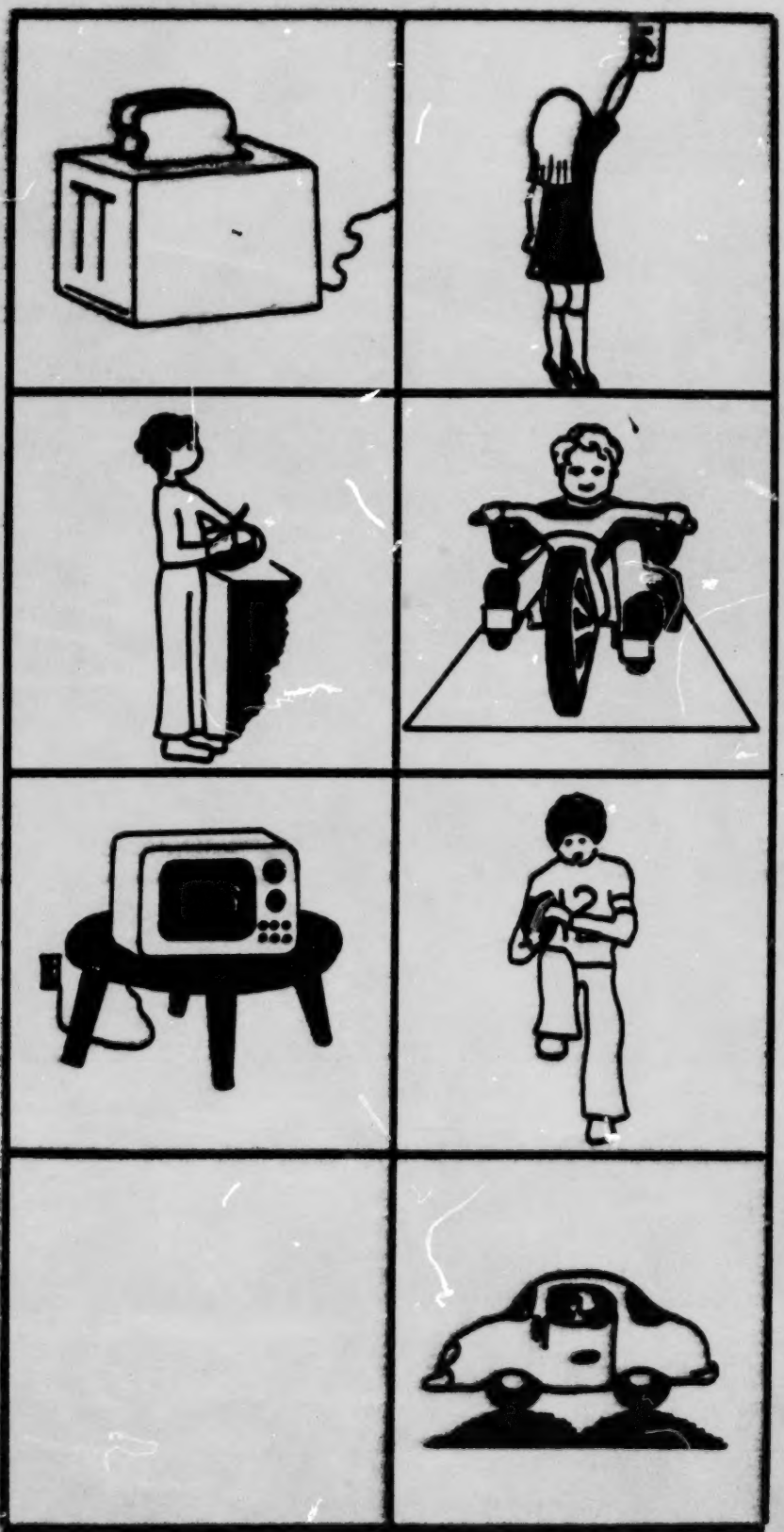

WORK
CITY
SANITATION

Pinwheel Pattern



Energy Inventory Sheet

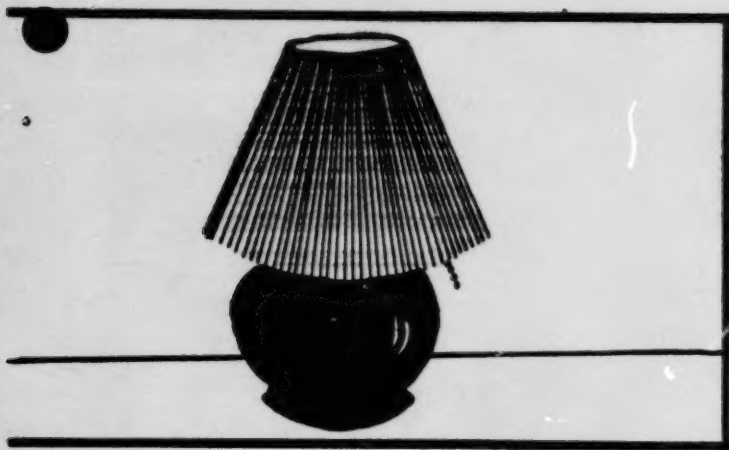
How Do You Use ENERGY?

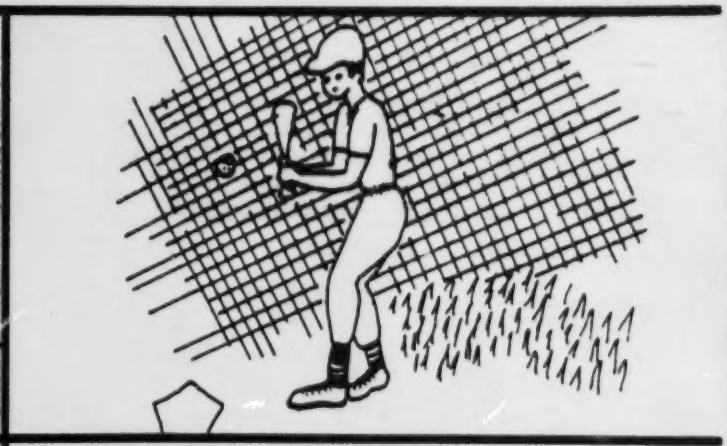


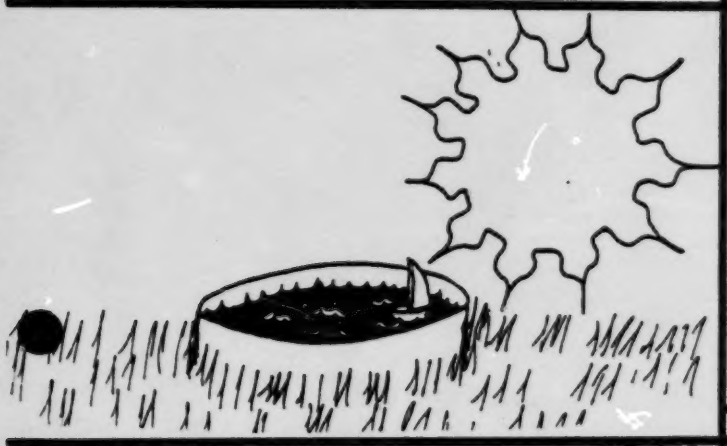
Energy Walk in the School

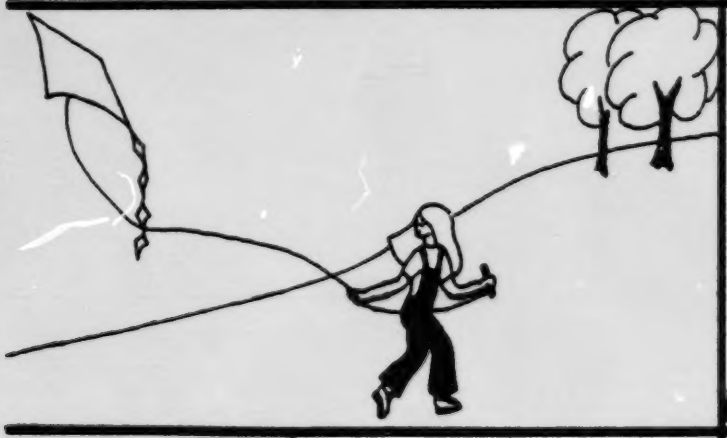
1. Which rooms did we visit?

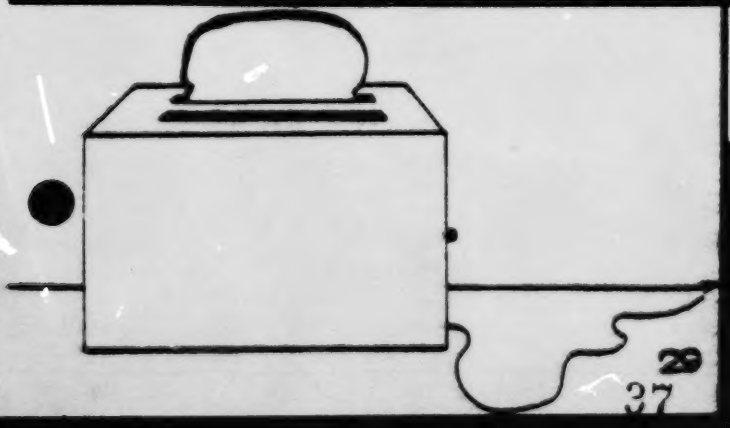
2. Where did we find energy used in each room?

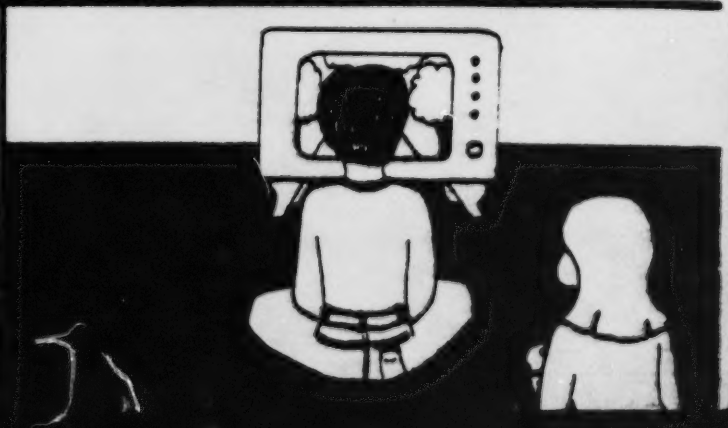


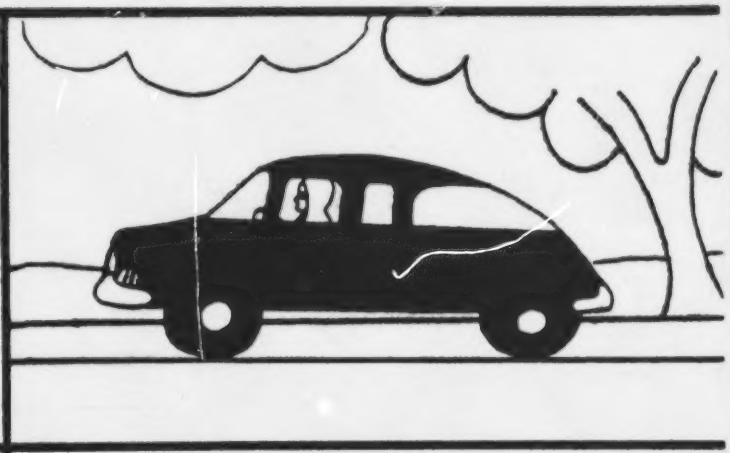


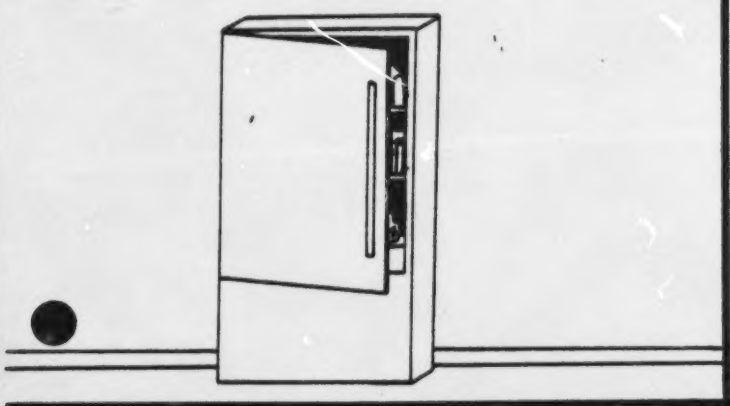






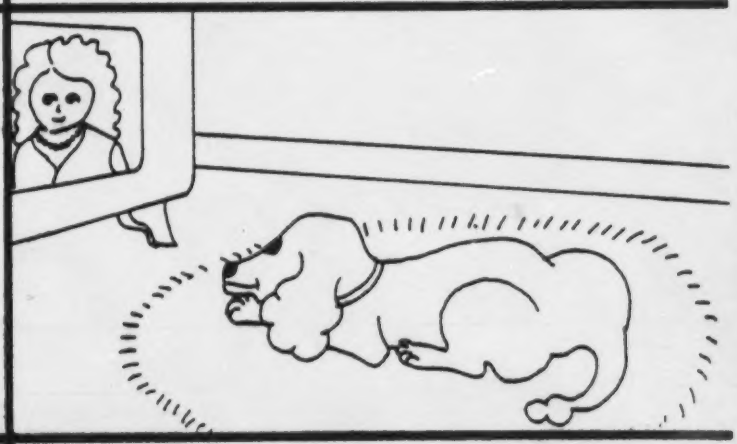


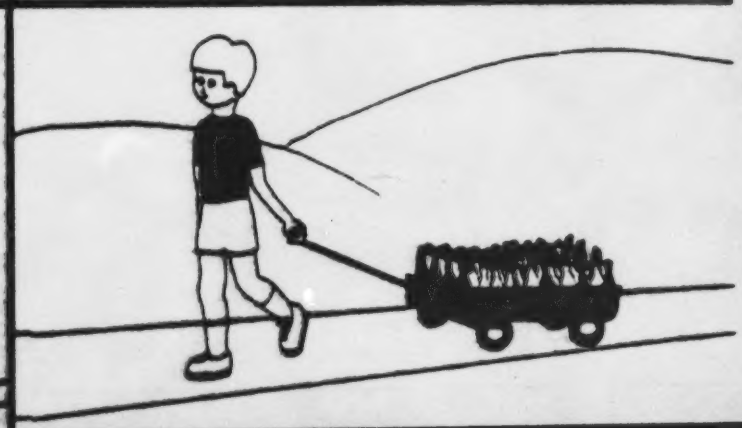




70
65
75
60
80
55
85

dan's grocery





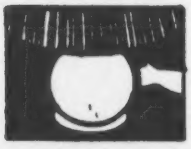
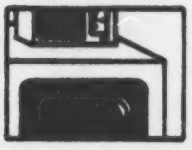
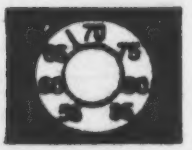
Dear Parents,

The children are busy learning about energy. They are also finding ways to conserve energy. Please use the following questions to begin a family discussion of energy. In this way the children will recognize the connection between what they learn at school and how they live. In the next day or so we will spend time discussing what the families talked about.

Thank you for your help.

1. How do people get energy?
2. Do we plan our meals so we get the most energy from what we eat?
3. What kinds of energy do we have in our home?
4. Where does energy come from?
5. What things in our home use the most energy?
6. What are we doing so we are not using too much energy?
7. What else can we do to cut down the amount of energy we use?

HOW DOES YOUR FAMILY RATE?

YES	NO		
☐	☐		Do you walk or ride bike instead of always using the car?
☐	☐		Do you turn off lights when not needed?
☐	☐		Do you keep the sun out on hot days?
☐	☐		Do you turn off TV and radio when no one is looking or listening?
☐	☐		Do you let the sun in on cold days?
☐	☐		Do you wear warmer clothes when it is cold?
☐	☐		Do you keep the thermostat lower in winter?
☐	☐		Do you try not to be wasteful?

How many times did you mark the "yes"? _____

How many times did you mark the "no"? _____

HOW DO I USE ELECTRICITY?

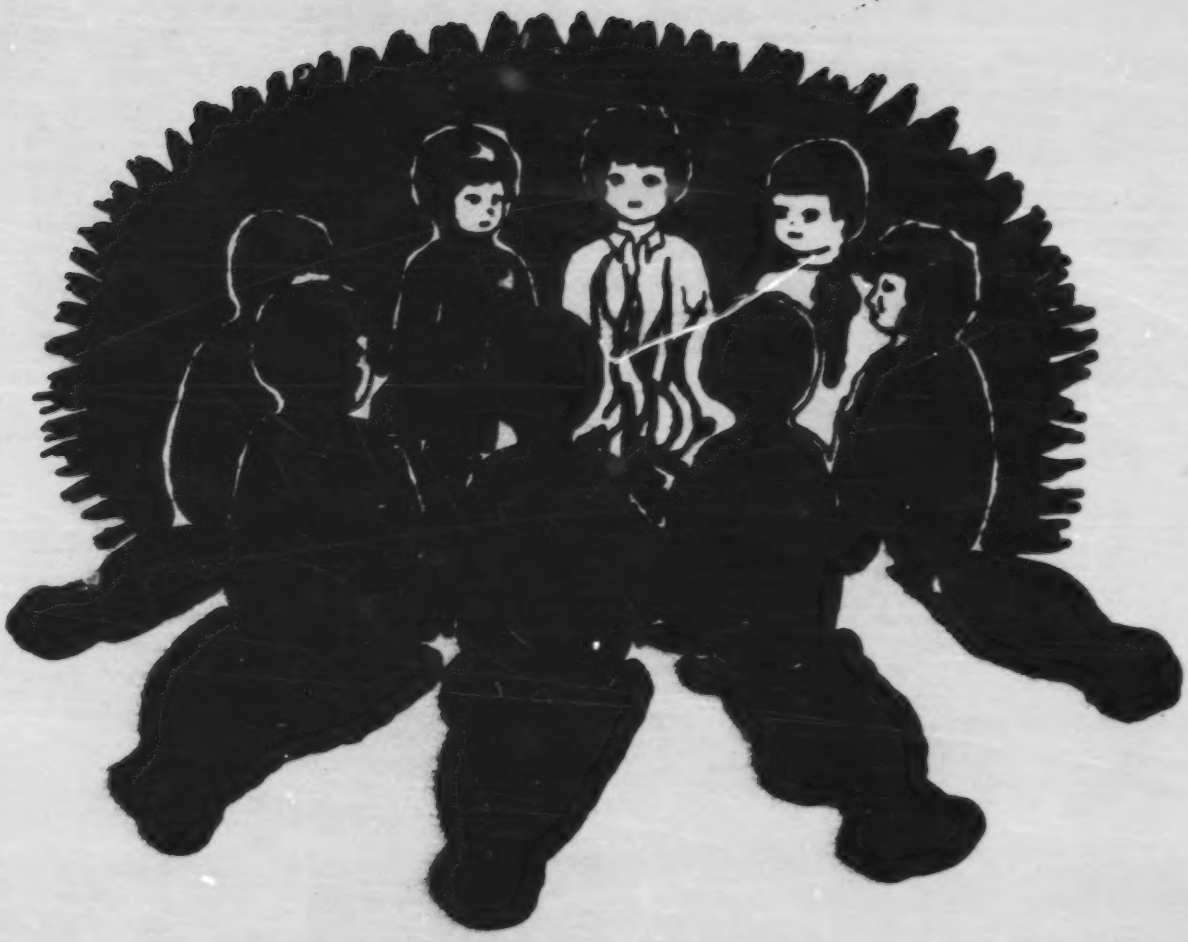
	What I Used That Used Electricity	The Reason I Used Electricity
(example)	1. Blender	1. Make chocolate shakes
	2.	2.
	3.	3.
	4.	4.
	5.	5.
	6.	6.
	7.	7.
	8.	8.
	9.	9.
	10.	10.

ENERGY IN MY HOME

The different ways I use energy in my home.

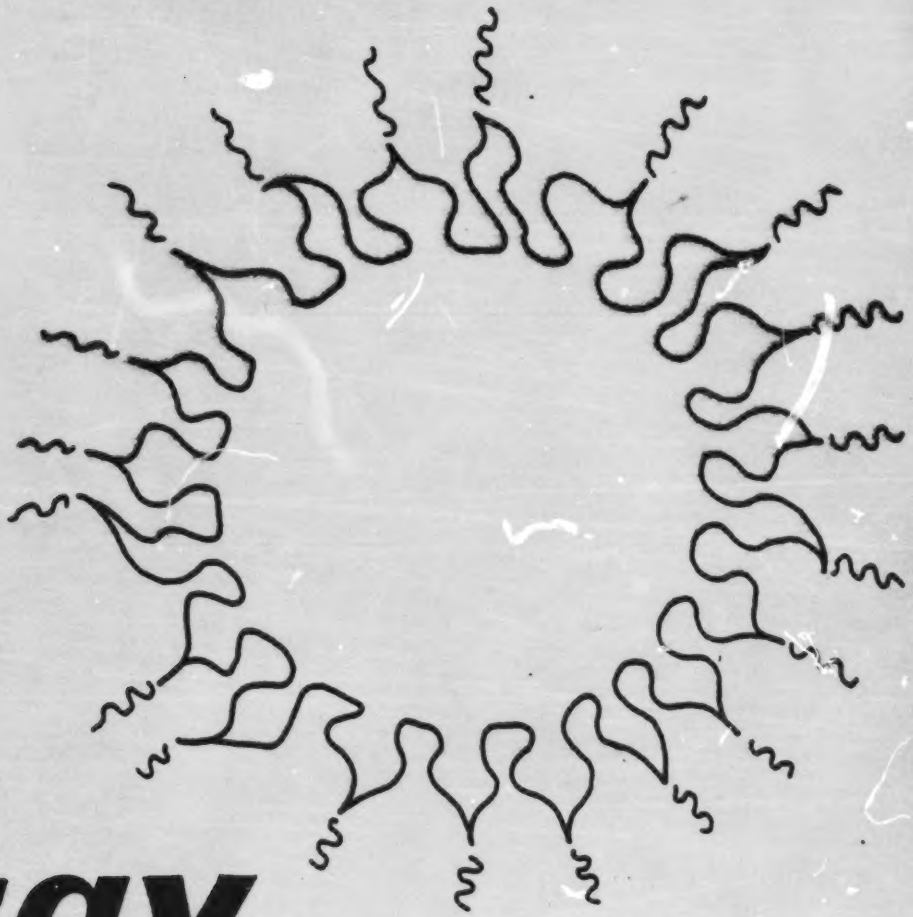
What I use the most.

What I use the least.



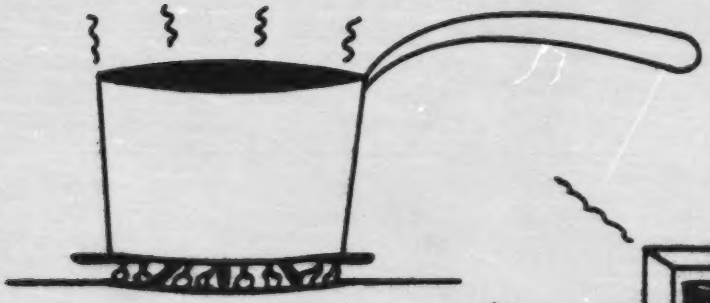
Energy

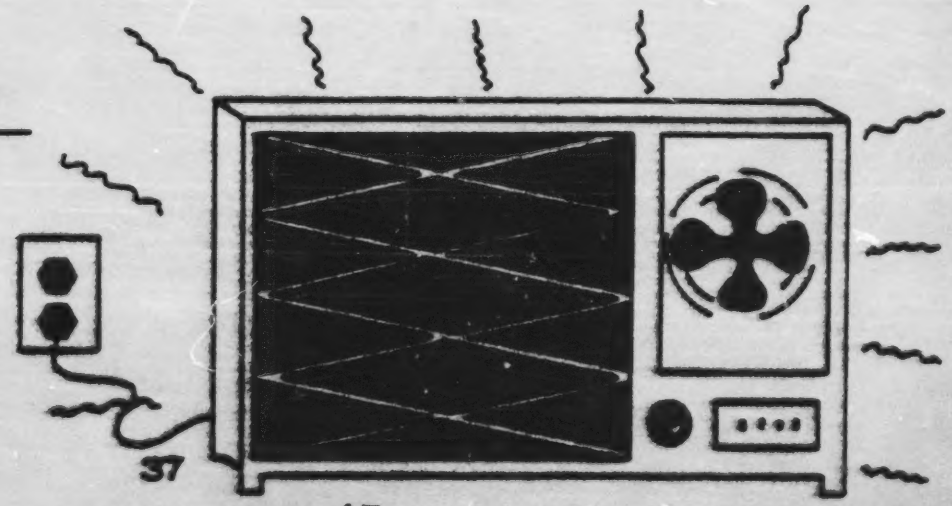
DOES MANY THINGS



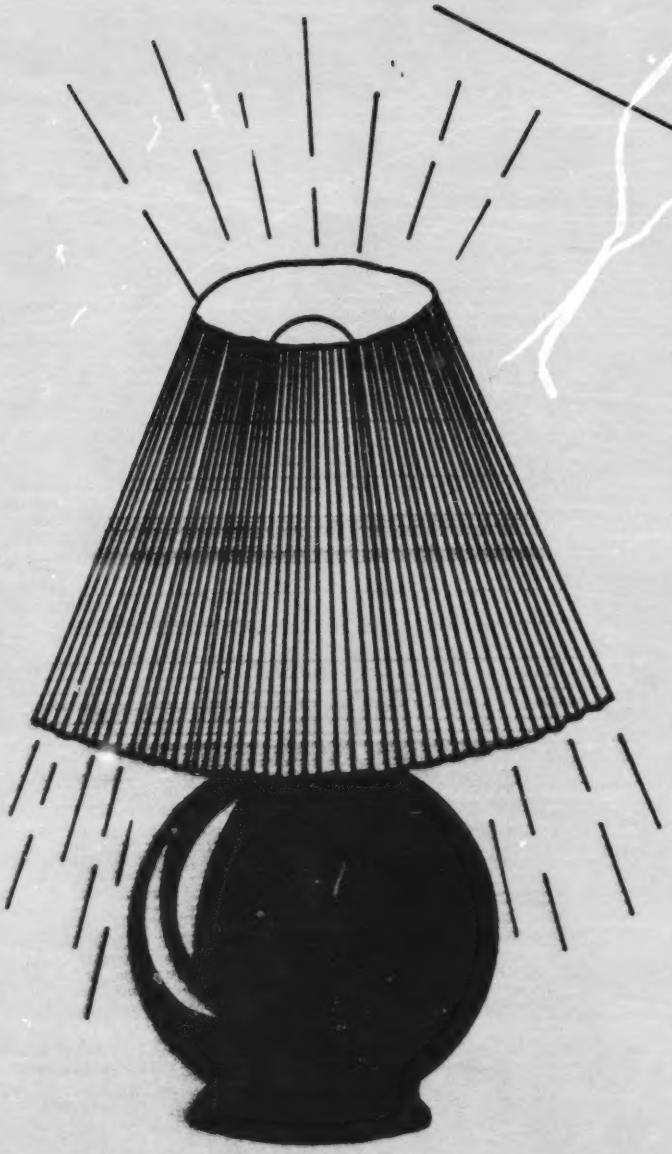
• Energy

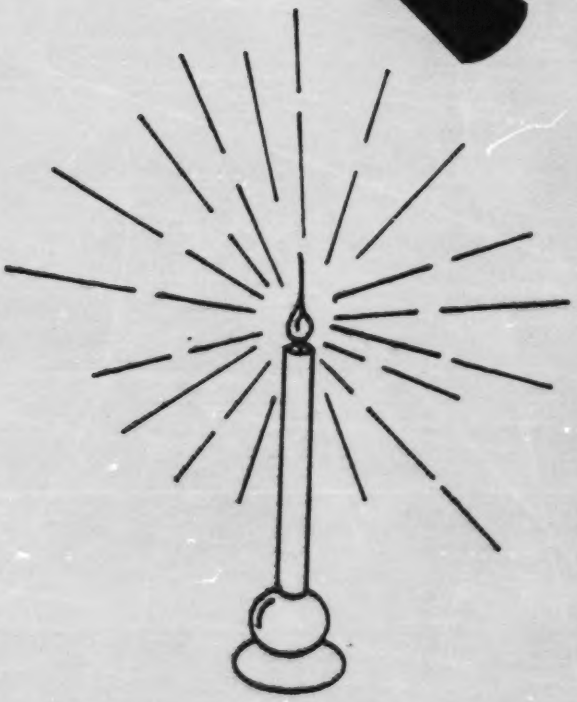
heats





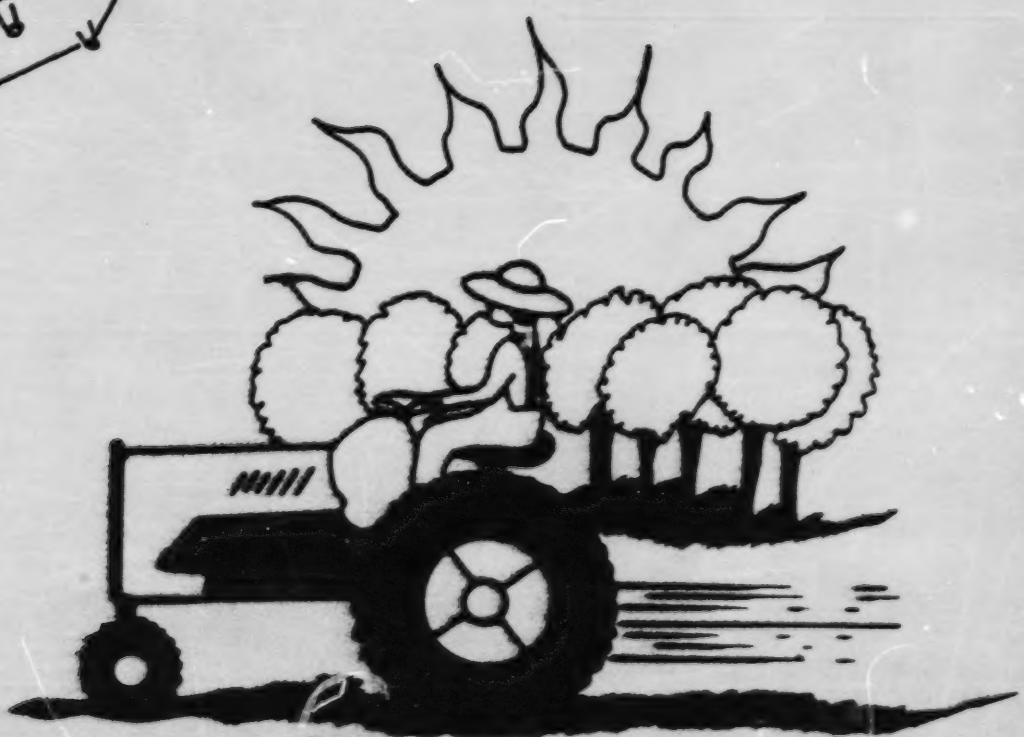
Energy LIGHTS





Energy

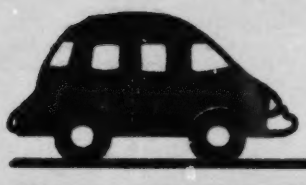
makes things MOVE



TRAFFIC SURVEY

Name _____

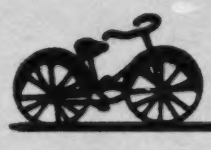
Time of Day _____ **How Many?**



Cars

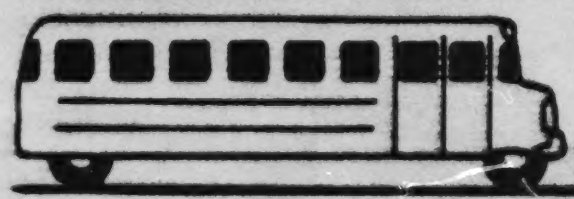
Trucks

Pickups



Bicycles

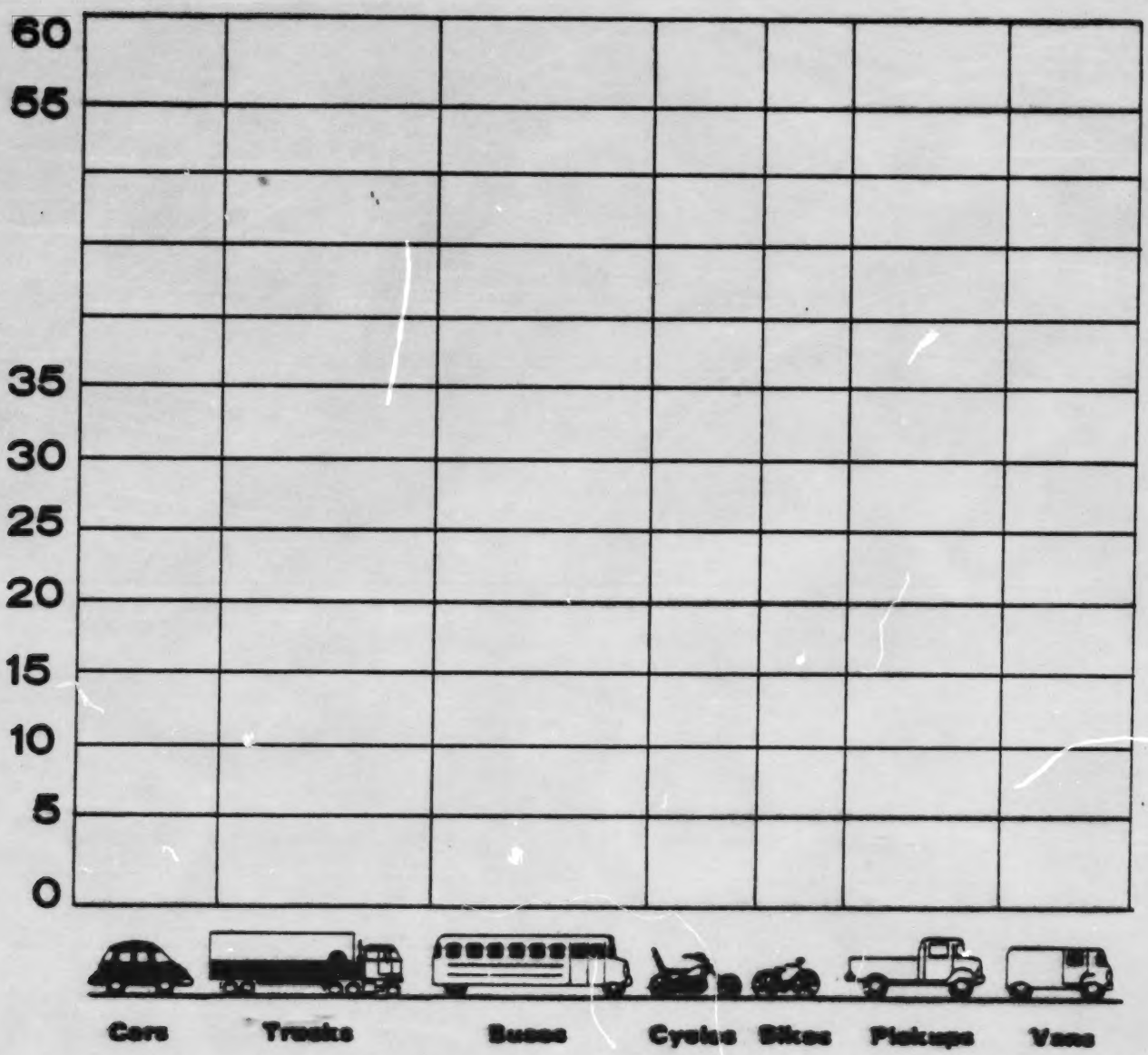
Motorcycles



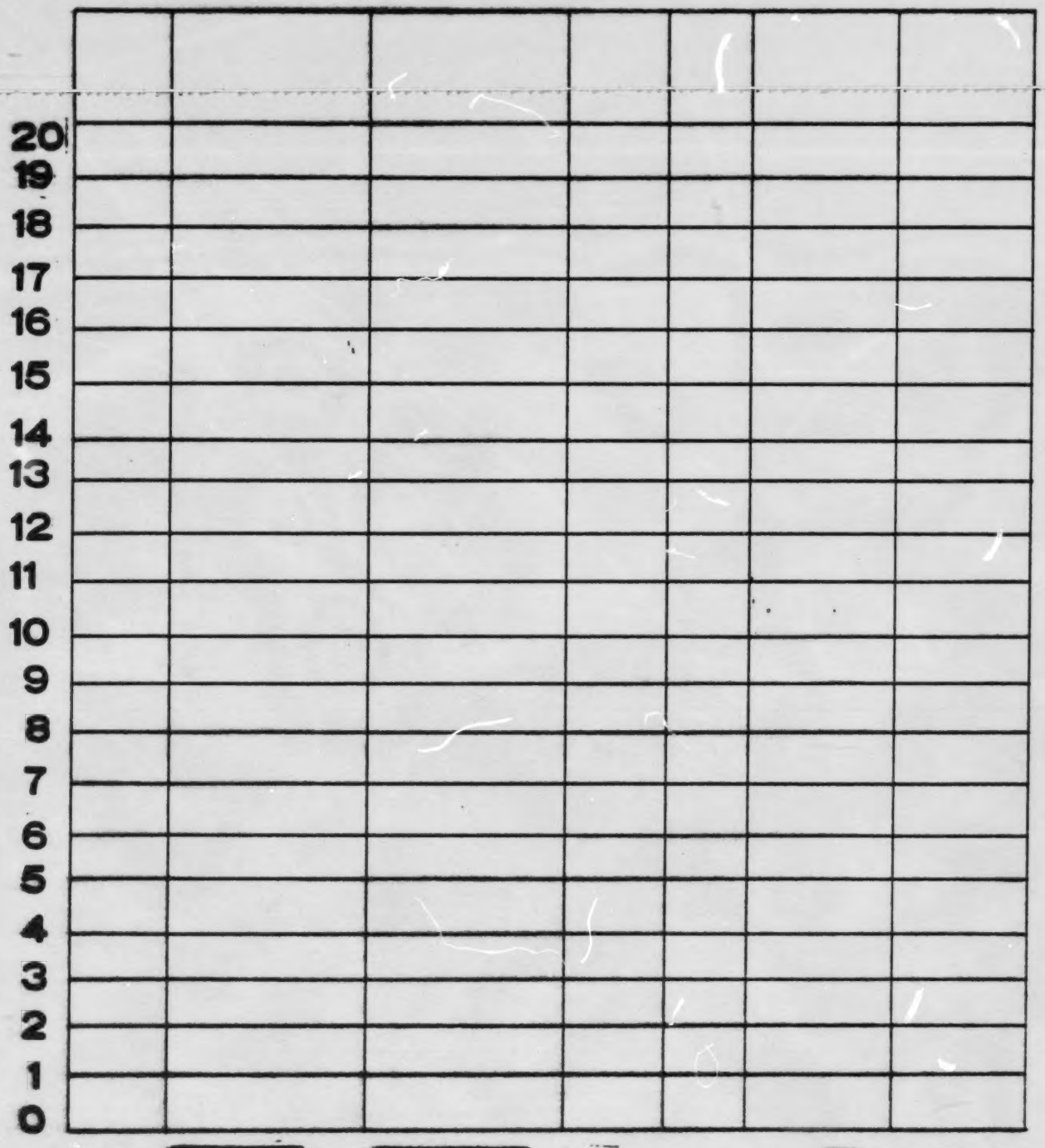
Buses

Vans

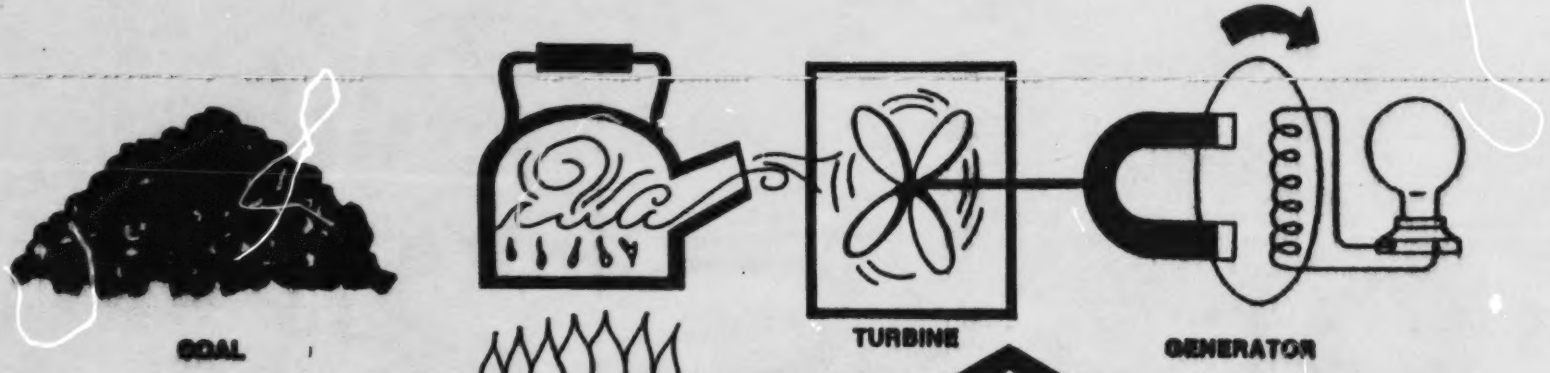
TRAFFIC SURVEY CHART

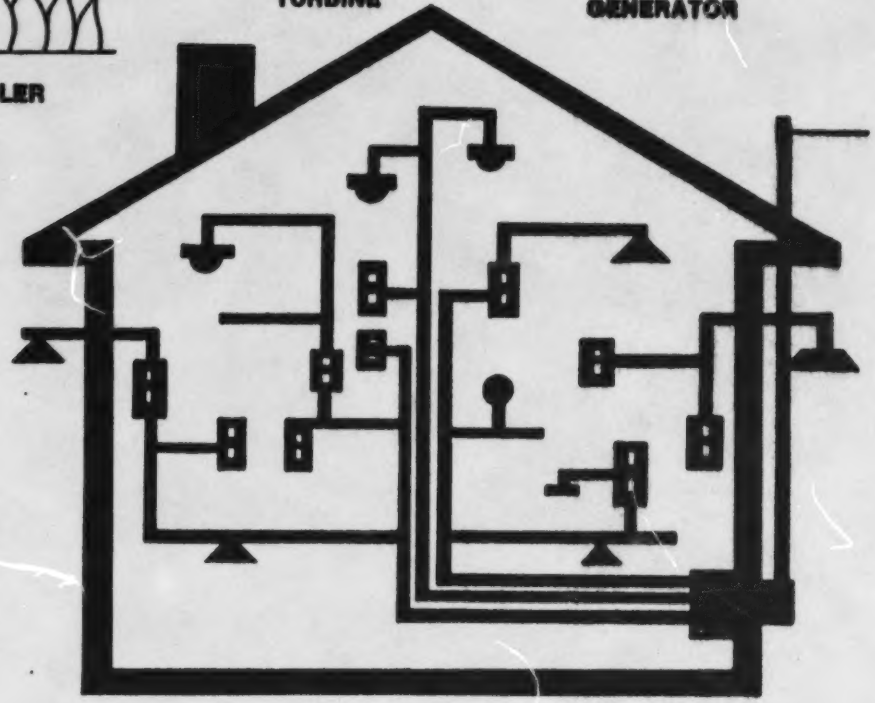


TRAFFIC SURVEY ~~COUNT~~



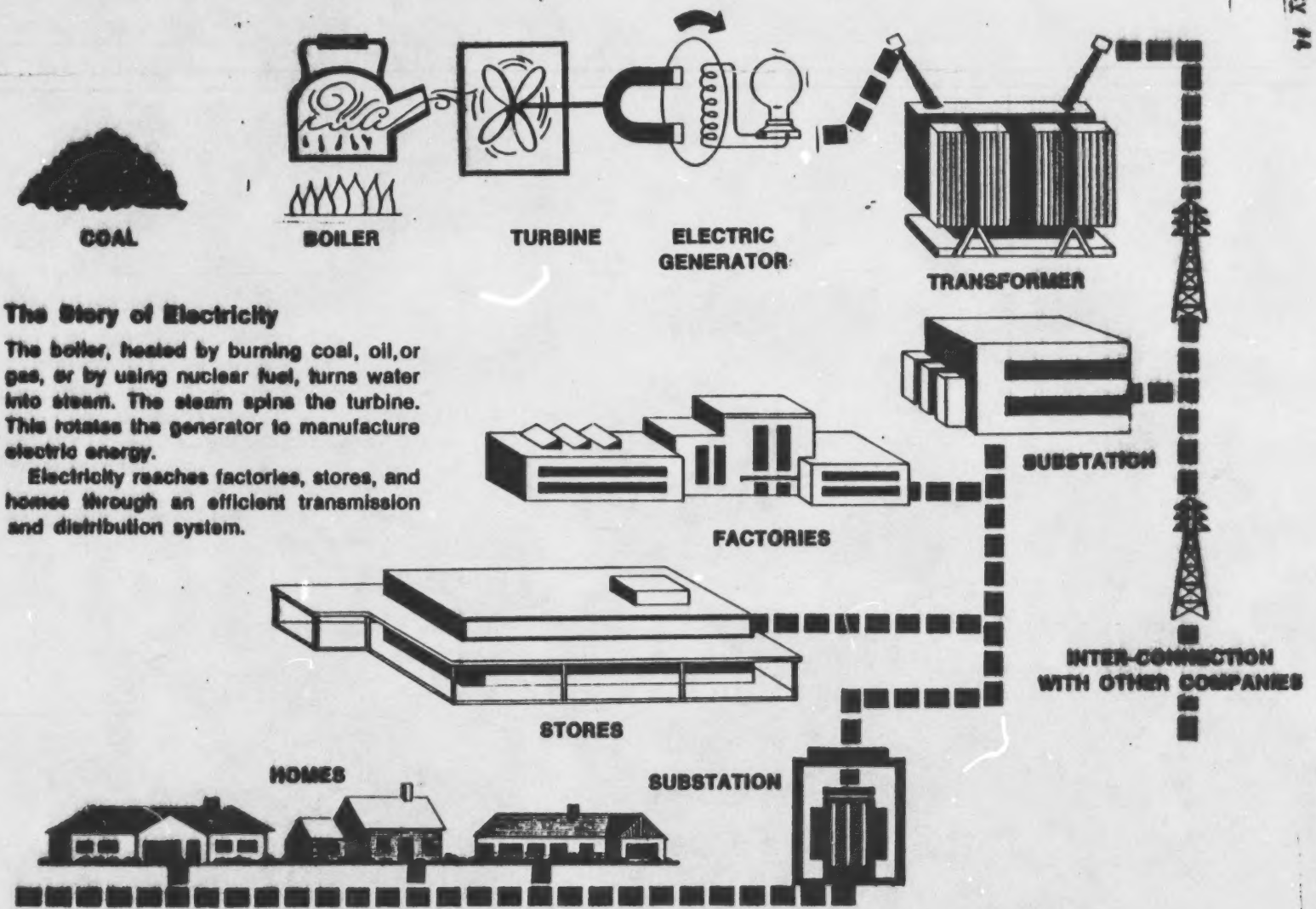
How Electricity is Produced





In your house, electricity comes into the main switch box, past the meter. Wires run around inside all the walls to all the plugs and switches. It's something like a tree.

The Story of Electricity



The Story of Electricity

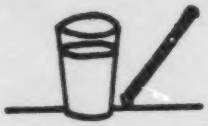
The boiler, heated by burning coal, oil, or gas, or by using nuclear fuel, turns water into steam. The steam spins the turbine. This rotates the generator to manufacture electric energy.

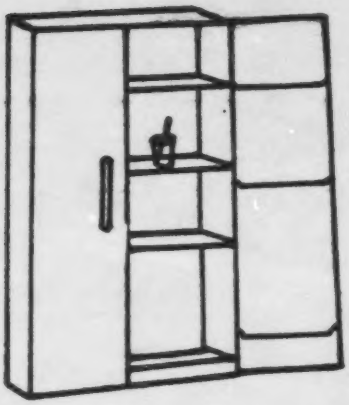
Electricity reaches factories, stores, and homes through an efficient transmission and distribution system.

HOW DOES INSULATION WORK?

1. Fill a glass with water.

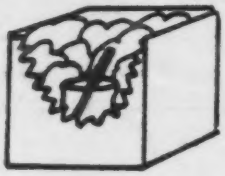
   Use a thermometer to check that the water is at 70° F.

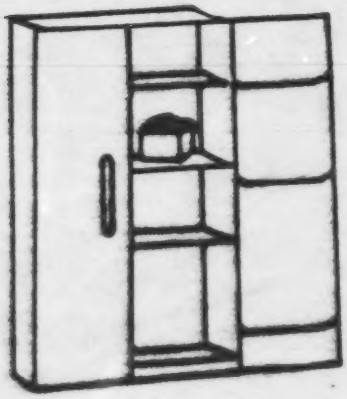




2. Put the thermometer in the glass, put the glass in the refrigerator and check the temperature every 5 minutes.

3. Refill the glass with water. Find a cardboard box and put cotton in the bottom. Put the glass on the cotton. Pack the empty spaces with cotton.





4. Put the box in the refrigerator and check the temperature every 5 minutes.

The cotton slows down the loss of heat. If you do not have enough insulation you burn more fuel to stay warm.

HOW DO STORM WINDOWS WORK?

1. Use a cardboard box and cut four large "windows." Put one window on each side of the box. Tape a piece of plastic over each opening (tape it on the inside).

2. Fill a glass with water, put in a thermometer, and put it in the box.

3. Put the box in the refrigerator and check the temperature every 3-5 minutes.

4. Add "storm windows." This time place the plastic over the outside of the openings. Pull the plastic tightly.

5. Put it in the refrigerator again and check the temperature.

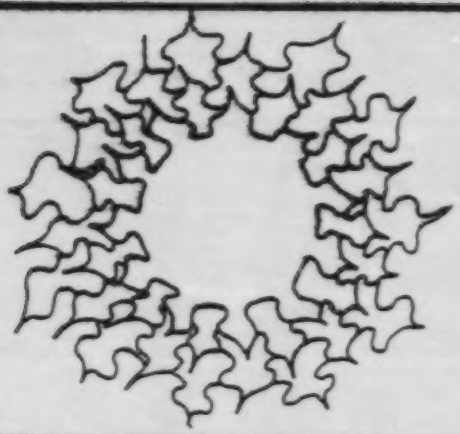
SAVE ENERGY GAME

Player Pieces

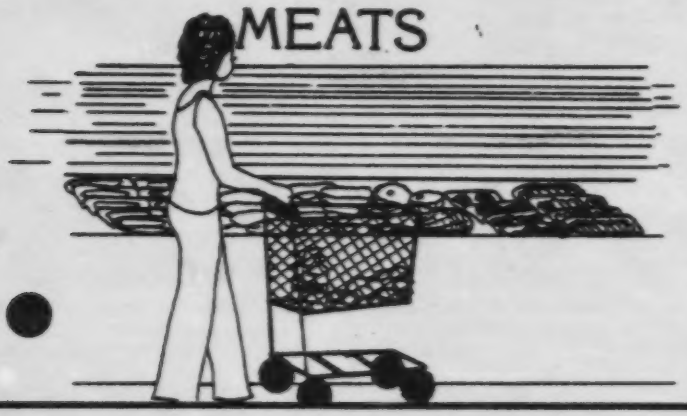
Cut out and put on cardboard

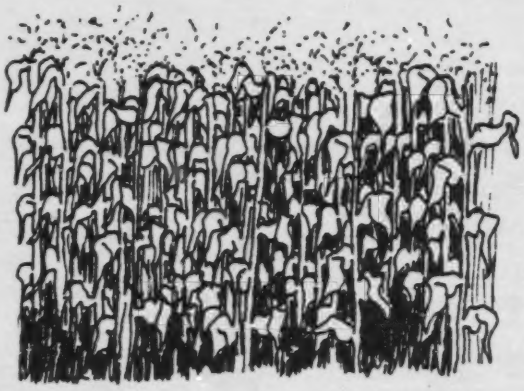
Four player pieces are included, however, more can play if you wish to devise pieces.

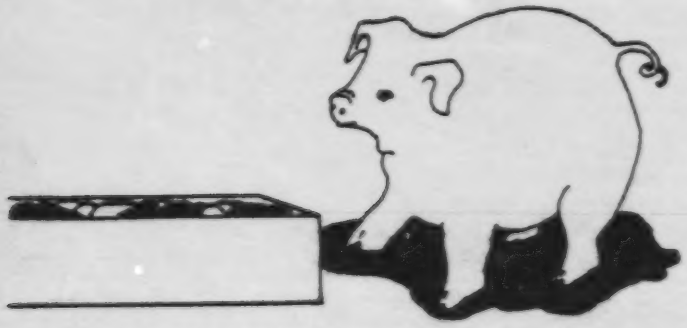
Use a die for determining number of spaces to be moved.

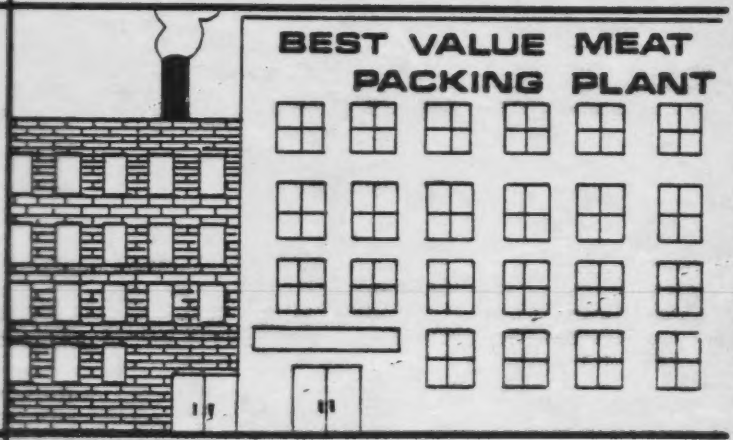


dan's grocery
BETTER
VALUE
MEATS


MEATS



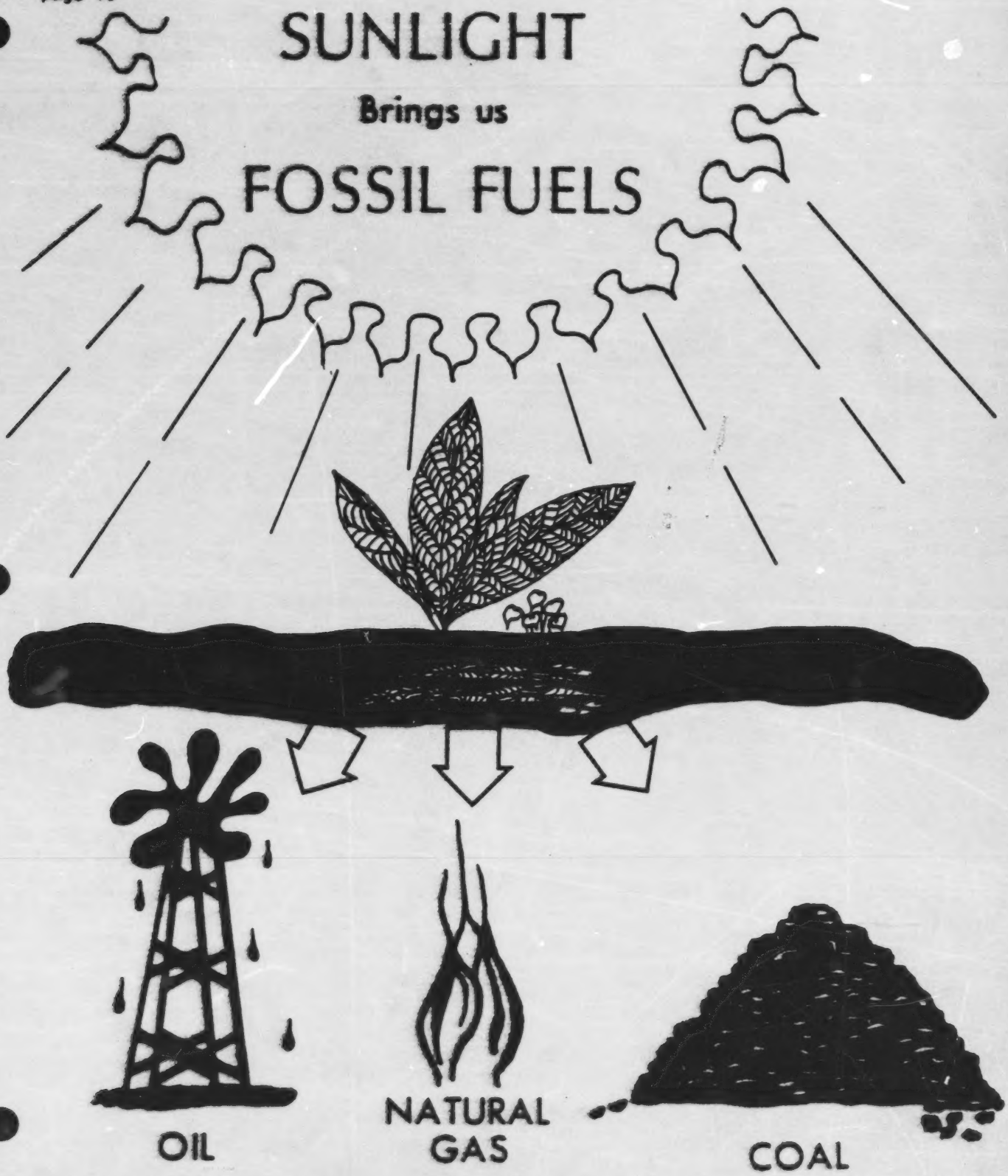



BEST VALUE MEAT
PACKING PLANT

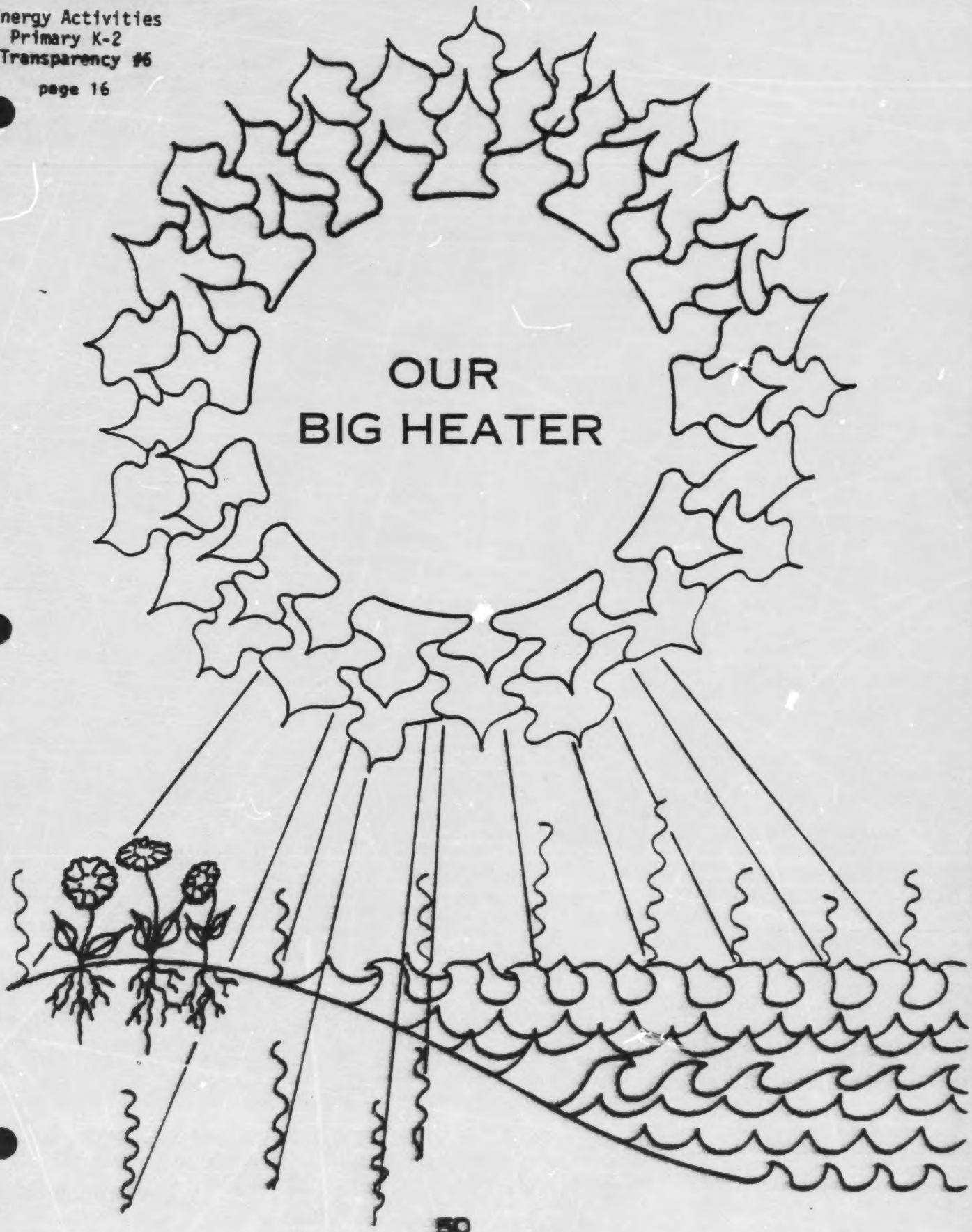
SUNLIGHT

Brings us

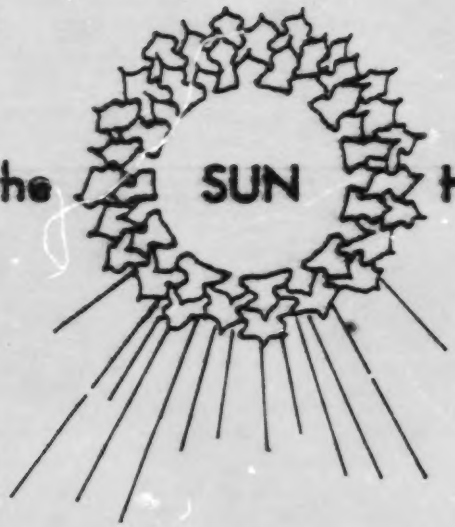
FOSSIL FUELS



OUR BIG HEATER

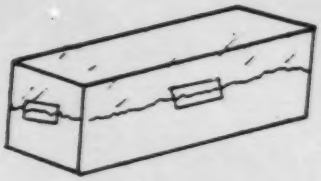


Let the SUN Help Heat Your House

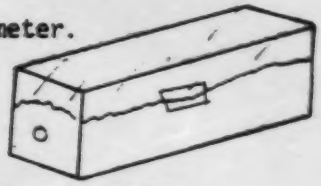


Energy from the sun is free! How can you use it?

Use a shoebox and tape a piece of plastic over the top.

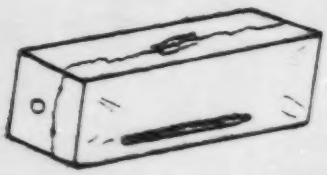


Punch a small hole in one end of the box and put in a thermometer.



On a sunny day put the box on the sunniest window sill with the plastic facing the sun.

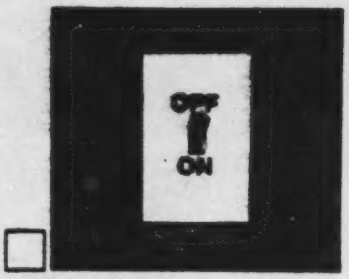
Watch the thermometer to check the temperature.

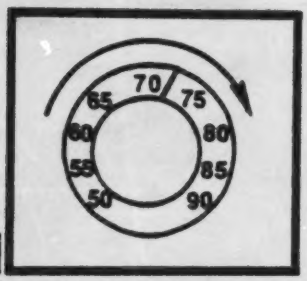


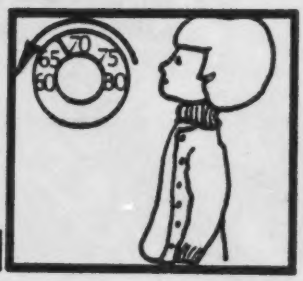
Put a piece of cloth over the plastic and check to see if the temperature rises slowly or quickly.

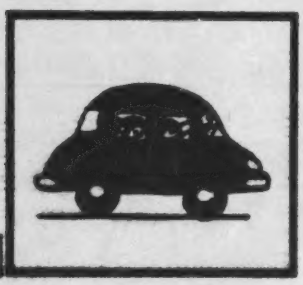
CONSERVATION CHECKLIST

Put a check in the box by the pictures that show how you can conserve energy.









Dear Parents,

Your children have begun learning about energy, especially energy found in the home and school. The children are also learning that we can conserve energy in many ways.

Please use the following questions to begin a family discussion of energy. Your children will thus have an opportunity to recognize the connection between what they learn at school and how they live. You need not limit your discussion to these questions but they should provide an interesting beginning!

Do take the time to talk with your children as we will be spending more time with energy education and they will be better able to relate to our studies.

Thank you.

1. Which of our appliances could we do without?
2. What form of energy runs our appliances?
3. What could we do so we wouldn't use our appliances so much?
4. Have we checked the amount of insulation in our home?
5. Where could we weatherstrip to save energy?
6. Do we use our car too much?
7. What are some activities we could do as a family that would not require extra outside energy?

ANNOTATED CHILDREN'S BIBLIOGRAPHY
Grades K-3

BOOKS AND PAMPHLETS

Bruger, M. Energy From the Sun. Thomas Y. Crowell Co., New York, NY, 1976, 33 pp., $5.95. (grades K-4).

Dalton, R. All About Energy. American Museum of Atomic Energy, Oak Ridge, TN, 1974. (grades 1-4).

Department of Environmental Quality. Let's Learn About Air Pollution. Department of Environmental Quality: Des Moines, Iowa. It has a delightful coloring book format for teaching young children about air pollution and what can be done about it.

Department of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830, The DOE has two free publications for students.
Energy Activities with Energy Ant is a 28-page booklet containing pages to color, along with printed material telling children about energy. In addition, it provides various activities the child can do to review what he or she understands about energy and how to use it wisely.
My Energy Book by Energy Ant offers 29 pages of colorful and easily read material which gives a comprehensive look at what energy is, sources of energy, uses of energy, and conservation.

Gutnik, Martin J. Energy--Its Past, Its Present, Its Future. Children's Press: Chicago, 1975. This is an attractive book for young children giving a brief look at energy sources and the future of our energy resources.

Houck, O. A. The Best Present of All. National Wildlife Federation, 1417 16th Street N.W., Washington, D.C. 20036, 1976. 24 pp. This is a comic brochure reprinted from the Ranger Rick magazine.

Iowa Power. My Energy Book looks like a coloring book, but it is much more. Through lively illustrations, mazes, hidden pictures, and matching games, students learn about energy sources, the steps in energy distribution, safety, solar power, and conservation. (grades K-2). Available to Iowa Power and Light customers in central and southwest Iowa through the local utility company. No charge.

Podendorf, Illa. Things Are Made to Move. Children's Press: Chicago, 1970, $4.50. This book concerns itself with the basics of force and energy.

Podendorf, Illa. The True Book of Energy. Children's Press: Chicago, 1971. The author relates the importance of kinds of energy to children's own experiences. The book contains short sections and many illustrations.

Ruchlis, Hyman. Thank You, Mr. Sun. Harvey House, Publishers: New York, 1966, 45 pp. This children's book provides many illustrations of how the sun helps humankind and nature.

Smaridge, Norah. Only Silly People Waste. Abingdon: Nashville, TN, 1976, 28 pp., $4.25. Fourteen silly poems introduce young children to the importance of conserving energy and materials.

Smith, H. Play with the Sun. McGraw-Hill Co., New York, NY, 1972, $5.72. (grades K-3).

Smith, Norman F. Sun Power. Coward, McCann & Geoghegan, Inc.: New York 1976, 46 pp., $4.64. (grades K-2). Everything that lives and grows on the earth uses energy from the sun. The book gives a new understanding and appreciation of the sun, our chief energy source.

Spetgang, T. Tilly's Catch-A-Sunbeam Coloring Book. Solar Service Corporation, P.O. Box 183, Cherry Hill, NJ 08002, 1976, $1.50. (grades 2-5).

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American Association of School Administrators. School Energy Crisis: Problems and Solutions. 1977, from AASA, 1801 N. Moore St., Arlington, VA 22209, $9.95 postpaid, discounts on orders of 2 or more. This is one of the best sources of data on the impact of rising energy costs, present and future, on school operating budgets. Examples of programs to reduce energy bills without capital spending and a guide for planning an energy cost-reduction program are included.

Carr, Donald E. Energy and the Earth Machine. New York, NY: W. W. Norton and Co., 1976, $10. Many historical insights, examples of alternatives used abroad, and a strong chapter on conservation make this a book of general interest. "The Lost Art of Conservation" was also published as a magazine article in The Atlantic, Dec. 1975, pp. 59-70.

Clark, Wilson. Energy for Survival: The Alternative to Extinction. Anchor Press/Doubleday and Co., New York, NY 1975. $4.95. One of the most extensive overviews of the social, environmental, and economic aspects of energy, this is the nearest thing to an "energy encyclopedia." Senior high students and adults will appreciate its nontechnical explanations of conventional and renewable energy uses and discussions of social and economic implications of the energy transition. An extensive reference guide to other sources is included.

Commoner, Barry. The Poverty of Power. New York, NY: Knopf, 1976, $2.25. An environmentalist examines the links between use and misuse of energy, capital, and labor in this controversial book predicting that huge energy conglomerates will become extinct.

Daniels, Farrington. Direct Use of the Sun's Energy. 1975 ed. Maryland: Ballantine Books, $1.95. This is a comprehensive summary of low-cost solar applications and the research behind it. It's the best available introduction to solar technology.

Eldridge, Frank. Wind Machines. National Science Foundation, Washington, DC, 1976, 78 pp., $30. Best available overview on wind machines with photos, illustrations and diagrams. Describes history, potential, application performance and system design of wind machines.

Fowler, John. Energy-Environment Source Book. National Science Teachers' Association, revised edition, 1978, $5., 1742 Connecticut Ave., N.W., Washington, DC 20009. This is a compilation of basic facts and issues related to energy use and supply, with emphasis on fossil fuels. Quantitative information abounds in many tables and technical appendices. Math and physical science teachers may appreciate this one most but there is a sizable section on "Energy, Society, and Environment" for social science teachers as well.

Gray, Elizabeth and Gray, David D. Growth and Its Implications for the Future. The Dinosaur Press, P.O. Box 666, Branford, CT 06405, 1975.

$3. Social, ethical, and physical constraints on growth of energy use, resource consumption, pollution, population, food production and land use are discussed in a question-and-answer format accompanied by numerous cartoons. Good selected reading.

Halacy, D. S., Jr. Wind, Sun, and Water: Our Energy Alternatives. Harper and Row, Inc., 10 E. 53rd St., New York, NY 10022, 1977, 192 pp., $9.95. Easily read. The renewable resources of geothermal, water, tidal, sea thermal energy, wind, biofuels, and solar energy are presented for consideration.

Hayes, Denis. Energy: The Case for Conservation. 1976, Worldwatch Institute, 1776 Massachusetts Ave., N.W., Washington, DC 20036, $2, for a single copy. Ask for quantity discounts. This mini-book is crammed full of energy-conserving strategies as well as a strong rationale for their use. All segments of U.S. consumption are covered. For senior high students and adults.

Hayes, Denis. Energy: The Solar Prospect. Worldwatch Institute, 1776 Massachusetts Ave., N.W., Washington, DC 20036, $2. This is an excellent, detailed summary of windpower, waterpower, biomass, and direct sunlight resources and their applications now and in the future. Recommended for teachers.

Hayes, Denis. Rays of Hope: The Transition to a Post-Petroleum World. W. W. Norton and Co., New York, NY, 1977, $3.95 (ppbk). Technological, economic, and social problems of fossil fuels versus solar are presented, with solar emerging the winner. This is a very persuasive argument for using renewable energy sources, and it includes much information on applications of alternative technologies.

Hodges, L. and Neff, J. Solar Energy 1976. Report from the Iowa Energy Policy Council, Lucas Bldg., Capitol Complex, Des Moines, IA 50319. This report is interesting reading. It describes some practical applications of solar technology in Iowa.

Lemish, J. Mineral Deposits of Iowa. Iowa Southern Utilities Co. and Craftsman Press, Burlington, 1969. Excellent resource on local mineral deposits and their potentials, this one should be on every teacher's shelf.

Lovins, Amory B. Soft Energy Paths: Toward a Durable Peace. Ballinger Pub. Co., 17 Dunster St., Harvard Square, Cambridge, MA 02138, 1977, $6.95. This insightful and controversial book presents alternatives to current patterns of energy excesses and waste. Changes in decisions on how to obtain and use energy are advised as prelude to a safe, agreeable future. Information on costs and commentary on values clarify the "soft path" position. For adults.

Lovins, Amory B. World Energy Strategies. Ballinger Pub. Co., 17 Dunster St., Harvard Square, Cambridge, MA 02138, 1975, $4.95. This is a basic source of facts, issues, and options that should be read by anyone seriously interested in the energy debate and decision-making. Choices among energy sources are presented in an understandable

but technical manner. The type of society we'll have in the future, however, depends on how much energy we think we need. Recommended for teachers.

Lovins, Armory B. and Price, John. Non-Nuclear Futures. Ballinger Pub. Co., 17 Dunster St., Harvard Square, Cambridge, MA 02138, 1975, $5.95. This influential work outlines concisely the main technical grounds for ethical, social, and economic concern about nuclear power in a way understandable to most people without technical training.

Lucas, Ted. How to Use Solar Energy in Your Home and Business. Ward Ritchie Press, Pasadena, CA, $8. Includes solar heating and cooling, electric cars, and wind systems.

Mazria, Edward. The Passive Solar Energy Book. Rodale Press, Emmaus, PA, 1979, $10.95. This comprehensive volume is two books in one. It is a primer on the fundamental concepts of heat transfer by solar energy and on its practical applications illustrated by photographs and performance data of many passive solar buildings. It is also a workbook containing step-by-step instructions on designing and sizing passive solar heating systems and how to calculate heat losses and gains, performance measures, and cost effectiveness. Excellent graphics support the clear, nontechnical language of the text. Yet there is plenty of data and basic formulae to provide practical assistance to the physical science or industrial arts teachers who want to know more of the how and why of solar energy transfer and storage.

Merrill, Richard and Gage, Thomas, eds. Energy Primer. New York: Dell Publishing Co., 1978, $7.95. This updated sourcebook is a catalog of information and sources of plans and materials for use of renewable forms of energy--sun, wind, water, and biofuels. Emphasis is on homes and small-scale systems suitable for families or small communities. Many illustrations and concise factual reports sprinkled throughout. The large-scale paperback format invites student browsing. Suggestions for items to build are numerous.

Murray R. Nuclear Energy: An Introduction to the Concepts, Systems, and Applications of Nuclear Processes. 1975, Pergamon Press, Elmsford, NY 10523, $14.50. Text cited as one of the most popular reference materials used by science teachers in North Carolina.

Pierotti, A., Keeler, A., and Fritsch, A. Energy and Food. revised, 1977, available for $6.90 from Citizens' Energy Project, 1110 - 6th St., N.W., #300, Washington, DC 20001. The authors outline energy used in production, processing, delivery, and marketing of selected food items and suggest some ways to reduce this consumption. Energy "costs" of beverages and some other common processed foods are specified.

Rothchild, John and Tenney, Frank. The Home Energy Guide: How to Cut Your Utility Bills. New York: Ballantine Books, 1978, $1.98. This is a very readable and portable paperback full of practical suggestions. A bargain!

Schmidt, F. H. and Bodansky, David. The Energy Controversy: The Fight Over Nuclear Power. 1976, Albion Pub. Co., 1736 Stockton St., San Francisco, CA 94133, $7.95 ($4.95 ppbk). This has been a very popular reference work for science teachers.

Stobaugh, R. and Yergin, D. Energy Future, Report of the Energy Project at the Harvard Business School. Random House Inc., 201 E. 50th St., New York, NY 10022, 1979, $12.95. Considering the limited prospects of other energy strategies, the authors argue for solar energy and conservation. Further, they advocate decentralized power as requiring less capital investment and producing quicker results. Comprehensive and highly readable.

Wilson, Mitchell. Energy. rev. ed. Life Science Library, Morristown, NJ: Time-Life Books, 1970, $7.95. This volume of the Life Science Library is a comprehensive, heavily illustrated book which examines energy from Galileo's discoveries to the laser beam. Sources of energy, measurement of energy, and each form of energy are discussed with the clarity typical of this series. One picture essay surveys the history and production of oil; other essays cover electrical phenomena, the power of the atom, and future power sources. A chronology recounts the history of atomic energy.

BOOKLETS

ABC's of Radiation. 1977. It is a free, 28-page booklet available to individuals sending a request to Public Affairs, Brookhaven National Laboratory, Associated Universities, Inc., Upton, NY 11973. This is clearly presented basic information about radiation from radioactive materials and nuclear reactors: definitions, measurements, risks, safety practices, and controls. Originally written for employees of a large laboratory using nuclear energy. The reading level is appropriate for advanced upper elementary students.

Basics of Solar Air Systems. It is from the Sheet Metal and Air Conditioning Industry, 1900 L St., NW, Suite 405, Washington, DC 20036. No charge. Elementary description of solar air systems, well illustrated.

Colder . . . Darker (analysis of FEA-sponsored National Survey of Household Energy Use) and Save Energy, Save Money (inexpensive conservation, insulation techniques) booklets available free from: Community Services Administration, Office of Energy Program, 1200 - 19th St., N.W., Washington, DC 20506.

Cooperative Extension, New York State, Save Energy, Save Dollars, available for $1.50 from Mailing Room, 7 Research Park, Cornell University, Ithaca, NY 14853. This collection of articles offers practical advice to homeowners, prospective homeowners, and consumers on ways to conserve energy in daily living.

Department of Energy (DOE) energy education materials are available free of charge from: U.S. Department of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. Ask for current list of

their many titles. Order in advance; two months waiting time for delivery is typical. Some representative titles are:

Careers in Energy Industries
Energy in Focus: Basic Data
The First Reactor
Flywheels: Storing Energy as Motion
Gas Mileage Guide for New Car Buyers
How to Save Money by Insulating Your Home
How to Understand Your Utility Bill
Nuclear Energy
Nuclear Power in Space
Nuclear Power Plant Safety
Sixty-Five Ways to Save Natural Gas
Solar Energy for Heating and Cooling
Tips for Energy Savers
Tips for the Motorist: Don't Be Fuelish

Department of Housing and Urban Development. In the Bank or Up the Chimney, U.S. Government Printing Office, Washington, DC 20402, Stock No. 023-000-00297-3, $1.70. This booklet is an elaborate worksheet that allows homeowners to compute costs and benefits of storm windows, insulation, weatherstripping, and other energy-saving practices. It requires 2-3 hours to complete, but provides much worthwhile information and exercises math skills at the same time.

Department of the Interior, Geological Survey. Natural Steam for Power is an illustrated fold-out brochure on one kind of geothermal power. Cost: 25¢ from U.S. Government Printing Office, Washington, DC 20402, Stock No. GPO-19740-548-685.

D.P.I., Energy Conservation in School Facilities. Iowa State Department of Public Instruction, Grimes State Office Bldg., Des Moines, Iowa 50319. Brochure lists specific recommendations for reducing energy waste in school buildings.

Eaton, William W. Energy Technology, Energy Storage, Geothermal Energy, Oil, and Solar Energy are all available free from DOE, Technical Information Center, Box 62, Oak Ridge, TN 37830. Multiple copies for classroom use will be mailed on request. Ask for a current listing of other free publications on a wide range of energy topics.

Edelson, Edward. Alternate Energy Sources is one of many useful free booklets provided to teachers by Edison Electric Institute, 90 Park Avenue, New York, NY 10016.

Energy, A Growing National Problem. Education Servicing Section, National Wildlife Federation, 1412 Sixteenth St., NW, Washington, DC 20036. Single copy free; additional 20¢ each; 50 or more, 16¢ each. The illustrated, 16-page report discusses our energy problem and solutions.

The Good News About Energy is a 49-page report of a 1979 study by the Council on Environmental Quality. It is available from the Executive Office of the President, Council on Environmental Quality, 722 Jackson Place, N.W., Washington, DC 20006. The potential for achieving lower energy growth in the United States and the implications for the economy, the environment, and government policy are discussed.

How to Save Gasoline . . . and Money is an 8-page pamphlet on efficient driving practices. Available free from DOE Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. Ask for a list of currently available publications on energy-related topics.

Iowa Energy Policy Council. Home Energy Savings Manual is a well-written booklet that provides basic energy conservation measures for the home. It has about 75 pp. and is free. It is available from the Iowa Energy Policy Council, Capitol Complex, Des Moines, IA 50319.

Iowa Power. A series of "Q and A" booklets were developed using a format of questions and answers to discuss the content. Titles are: Gas Safety, Gas Supply, Utility Regulation, Electric Safety, Electric Supply and Profit. Each booklet is about 5 pages in length and is available to customers in the Iowa Power and Light service area in central and southwest Iowa through the local utility office.

Miller, Alan S., et al. Solar Access and Land Use: State of the Law 1977, free, from the National Solar Heating and Cooling Information Center, P.O. Box 1607, Rockville, MD 20850. This is a summary of solar access rights for various buildings depending on solar input for comfort and is part of a larger study, Legal Barriers to Solar Heating and Cooling of Buildings.

Olin, Hubert L. Coal Mining in Iowa, State Mining Board, State of Iowa, Des Moines, Iowa 50319. Early history of coal mining in Iowa and role of coal in development of the state's economy are presented.

Solar Energy - Progress and Promise. Executive Office of the President, Council on Environmental Quality, 722 Jackson Place, NW, Washington, DC 20006. The 42-page booklet discusses progress in the development of various aspects of solar energy utilization.

Your Energy World. Department of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. This 1977 publication is for grades 4-6 and is free.

TEACHER AIDS

American Gas Association, 1515 Wilson Blvd., Arlington, VA 22209, will send teachers free copies of their educational services newsletter, Natural Gas Energy. Reading level is adult. Each issue focuses on one topic. For example, Volume 8, No. 2 is devoted to "Fuels from Biomass." Other recent issues centered on "Synthetic Natural Gas from Peat," "Coal Gasification," "Natural Gas and the Environment," "Energy Balances." Free kits are available such as: Natural Gas Serves Our Community Kit for grades 4-5 or grades 2-3. A booklet is also offered by the title Natural Gas Serves Our Community Booklet for grades 2-3 or 4-5. Additional free booklets are:

Natural Gas - Science Behind Your Burner
Experiments: Properties of Gas and Heat Energy

How Your Gas Meter Works
Look to the Future - The Gas Company in Your Community
History of Natural Gas
The Story of Natural Gas Energy

Carey, Helen. Award Winning Energy Education Activities for Elementary and High School Teachers. 1977, available at no cost from DOE Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830.

CEL Blocks. Primary Interdisciplinary Environmental Learning Packets, Brevard County, FL. (ESEA Title III, Project #050-2323-73003). Student cards covering areas of environmental education which can be used by teachers in a variety of interdisciplinary ways.

Community Workers and the Energy They Use. National Science Teachers Association, (grade two), 1976, free. Available from DOE Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830.

Curriculum for Appropriate Technology. National Center for Appropriate Technology, P.O. Box 3838, Butte, MT 59701. $5. The packet includes a selection of ten activities about present and future energy systems. Topics covered are: Energy Production and Use, Food and Nutrition, Renewable Resources, plus Cans and Recycling. Posters, handouts, and learning games are included.

Education Packets: Wind Conservation, Solar and Chemical Energy. Simple and well described projects are suggested for upper elementary students. Obtain from: American Museum of Atomic Energy, P.O. Box 117, Oak Ridge, TN 37830.

Edison Experiments You Can Do is available for 50¢ from the Charles Edison Fund, David O. Schantz, Curator, 101 South Harrison Street, East Orange, NJ 07018. This is a collection of seven booklets describing 75 experiments related to concepts of electricity. Alternative Energy Sources, Energy Conservation, Nuclear Experiments, and Environmental Experiments are among the topics included.

Energy. Environmental Education Project, ESEA Title III, Section 306 Topeka Public and Parochial Schools, 1601 Van Buren, Topeka, KS 66612 (ED 093 649). Objectives are listed, along with activities which meet the stated objectives. Teachers select only those appropriate to the objectives for their students.

Energy. Michigan United Conservation Clubs, P.O. Box 30235, Lansing, MI 48909. Provides information on the nature of energy, sources and uses of energy, and conservation. There are also some work sheets and ideas for helping others learn more about energy.

Energy. Social Issues Resource Series, Eleanor C. Goldstein, 1975. Social Issues Resource Series, Inc., 1200 Quince Orchard Boulevard, Gaithersburg, MD 20760. Notebook filled with reprints of articles related to energy.

Energy Activities for the Classroom - 1976. Coon, Herbert L. and Michele Y. Alexander, 1976. ERIC Center for Science, Mathematics and Environmental Education College of Education, the Ohio State University, 1200 Chambers Road, Third Floor, Columbus, Ohio 43212. Resource booklet of energy teaching activities divided into grade levels: K-3, 4-6, 7-9, 10-12.

Energy Conservation Classroom Kits 1-3, 4-6. Southern California Edison Company, 1976. Educational Services, Room 397, P.O. Box 800, Rosemead, CA 91770. Colorful kits to help teachers teach about energy conservation. There are folders, inspector cards, stickers, certificates. The teacher's guide contains ideas and lesson plans, in addition to duplicating masters.

Energy Crisis Teaching Resources. Curry, Wendell, et. al., Oregon State Board of Education, Salem, OR, 1973, 59 pp. (ED 085 316). Many very useful activities to be used in stressing individual responsibility towards energy crisis problems.

The Energy Crisis: What You Can Do About It. Standard Oil Company (Indiana), 1973. Mail Code 3705, 200 E. Randolph Drive, Chicago, IL 60601. Folder containing four spirit masters and specific teaching instructions. The spirit masters give information and ask for students to supply some interpretation. Parents and other adults are encouraged to participate.

Energy Education Activities for Elementary and High School Teachers. National Science Teacher Association, 1724 Connecticut Ave., NW, Washington, DC 20036. 1978, Free.

Energy - Environment Materials Guide. Mervine, Kathryn E. and Rebecca E. Cawley, National Science Teachers Association, Washington, DC, 1975, (ED 111 663). Handy source book containing annotated bibliographies for teachers, students. Non-print material.

Energy - Environment Mini-Unit Guide. Smith, Stephen M., ed., 1975. National Science Teachers Association, Washington, DC, (ED 111 664). Materials designed to stimulate decision making in young children and to make teaching more interdisciplinary. It is filled with many activities and guidelines.

Energy and Man's Environment. Jones, John, D.Ed., Editor, 1976. Energy and Man's Environment, Inc., 0224 S.W. Hamilton, Suite 301, Portland, OR 97201. Interdisciplinary teacher's guides to energy and environmental activities. Involves 8 books - Activity Guide, Uses of Energy, Sources of Energy, Impacts of Energy, Limits of Energy, Conversion of Energy, Future Sources of Energy, Glossary.

Energy and Man's Environment - Activity Guide. Ris, Thomas F. Energy and Man's Environment, 2121 Fifth Avenue, Seattle, WA 98121, (ED 106 070). Provides educational strategies and materials needed for introducing energy to all grade levels on an interdisciplinary basis. Each chapter has four themes: (1) Scientific, (2) Ethical, (3) Aesthetic, (4) Utilitarian.

Energy for Today and Tomorrow. San Diego City/County School's Energy Education Committee Department of Education, San Diego County, 6401 Linda Vista Road, San Diego, CA 92111, 1975. Activities for students in grades kindergarten through six. These help to create an awareness of the need of dealing with energy problems.

Energy is Basic is a free information pack from the Energy Action Office, Westinghouse Nuclear Fuel Division, P.O. Drawer R, Columbia, SC 29250.

The Energy Show. The New Western Energy Show, 226 Power Block, Helena, MT 59601. It is a script for a puppet or acting show. $3.50.

The Energy We Use. National Science Teachers Association, (grade one), 1976, free. Available from DOE Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830.

Environmental Education: Strategies for Wise Use of Energy. Division of Science Education, North Carolina Department of Public Instruction, Raleigh, NC 27611, c. 1974. Designed for use at all grade levels, therefore, activities are grouped K-3, 4-6, 7-12. An appendix contains charts, glossary, bibliography, checklists.

Get Your Hands on Energy. The New Western Energy Show, 226 Power Block, Helena, MT 59601. A collection of simple, practical, "hands on" projects deals with energy concepts. $3.50.

Living Within Our Means: Energy and Scarcity. Environmental Educational Instructional Activities K-6, The University of the State of New York, The State Education Department, Albany, NY 12234. Instructional manual which illustrates ways in which environmental concerns may be integrated into the curriculum. Excellent activities arranged according to disciplines.

Mickey Mouse and Goofy Explore Energy. Walt Disney Productions, 1976. Public Affairs Department, EXXON, U.S.A., P.O. Box 2180, Houston, TX 77001. Very comprehensive, yet delightfully presented energy comic book. Copies are available from the above address. Covers previous sources of energy and possible future sources.

Nineteen Fact Sheets On Alternative Energy Sources. (1977) Sheets include wind; bioconversion; solar, ocean, geothermal, and nuclear power; coal-derived fuels; conservation; energy storage; environmental impacts; a glossary and a bibliography are also results of NSTA/DOE cooperation. The sheets are available from the Department of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. The materials were prepared by the National Science Teachers' Association.

North Carolina DPI, The Energy Conserver, available on request from the Division of Science Education, Room 284 Education Building, Raleigh, NC 27611, is a monthly newsletter full of tips on energy and schools, conservation projects, and classroom activities.

Student Learning Activity Module "The Energy Crisis". Hughes, Judi and Lee County Environmental Education Program, Title III ESEA, 2266 Second Street, Fort Myers, FL. Contains lesson plans, resource

materials, and a Student Teaching Module on energy. Developed to help create an awareness of the causes, and some solutions for the energy crisis the world is facing.

A Teacher's Guide For Energy Conservation. Contact: Jonathan Wert, Environmental Center, University of Tennessee, South Stadium Hall, Knoxville, TN 37916.

A Teacher's Handbook on Energy. Interstate Energy Leadership Project, Colorado Department of Education, 201 E. Colfax Ave., Denver, CO 80203.

Ways to Environmental Education; Volume III, Allen, Rodney F., Ed. and Others. Florida State University, Tallahassee College of Education, Tallahassee Junior Museum, FL, 1975, 150 pp. Ten environmental booklets in one volume. One booklet covers energy learning activities for camp and home.

Wide World of Energy Kit. Walt Disney Productions, 1976, Walt Disney Educational Media Company, 500 South Buena Vista Street, Burbank, CA 91521. Kit contains cassette and color filmstrip titled, "The Search for Power and Energy;" 18 full-color study prints; Energy Game; 30 copies of the energy comic book, "Mickey Mouse and Goofy Explore Energy;" 10 energy activity cards; teacher's guide with information and additional activities.

PERIODICALS

ALTERNATIVE SOURCES OF ENERGY features articles on many aspects of alternative technologies and is a clearinghouse for practical ideas on energy sources. Bi-monthly, $10/yr. from Alternative Sources of Energy, Inc., Route 2, Box 90A, Milaca, MN 56353.

CURRENTS is a survey of solar legislation, research, workshops, and alternative energy issues in Iowa. Published by Citizens United for Responsible Energy, 3500 Kingman Blvd., Des Moines, IA 50311 at $5/year.

EARTH JOURNAL, published quarterly, regularly features energy-related subjects. Costs $3/yr. from Minnesota Geographic Society, P.O. Box 6181, Minnehaha Sta., Minneapolis, MN 55406.

ENERGY AND EDUCATION, a bi-monthly newsletter is available free from NSTA, 1724 Connecticut Ave. NW, Washington, DC 20036. It features energy facts and news of educational programs across the country.

FREE ENVIRONMENT NEWSBRIEFS. Published eight times per year by Free Environment, Inc., Activities Center, Iowa Memorial Union, Iowa City, IA 52242 - $2. Deals with all types of environmental issues.

IOWA ENERGY BULLETIN. Published monthly by Iowa Energy Policy Council, 215 East 7th Street, Des Moines, IA 50319 - no charge. A survey of Iowa energy and conservation issues.

IOWA SCIENCE TEACHERS' JOURNAL, a quarterly, is available free to science teachers requesting it on the school letterhead, c/o Managing Editor, ISTJ, Iowa Academy of Science, University of Northern Iowa, Cedar Falls, IA 50613. Volume 16, No. 1 (April 1979) focused on energy, with Iowa-specific information.

MOTHER EARTH NEWS is romantically "back to the land." It has interesting articles on unusual homes, low-energy life styles, recycling and bartering, "do-it-yourself" everything.

PEOPLE AND ENERGY is published monthly by Citizens' Energy Project, 1413 K Street NW, 8th Floor, Washington, DC 20005, $10. News of citizen action on energy and appropriate technology.

SCIENCE NEWS has weekly articles on energy research and technology.

MULTI-MEDIA MATERIALS

16 mm films, filmstrips, video cassettes and posters: The following items are a small, selected sample of the materials available on ENERGY.

For a broader listing of resources available to you at low or no-cost, contact your AEA, the media center of the nearest university, and the organizations listed in this publication. Also recommended is an excellent film bibliography, bound for library use and arranged by topics (What is Energy? Energy Issues and Options, Energy and the Environment, Energy Conservation, Sources of Energy). It is available at cost, $3, from New York State Alliance to Save Energy, 36 W. 44th Street, Room 709, New York, NY 10036. Ask for Energy on Film.

Filmstrips referred to in the ECAP's can be borrowed from your local AEA. In 1978, the AEA's received five sets of filmstrips. Some may have been sold to individual districts. Contact the DPI Energy Consultant if you are unable to locate a filmstrip through the AEA media center.

THE AMERICAN DREAM IS RUNNING OUT OF FUEL. 18 minutes, color, $230 or $19-rent (grades 5-8). Films, Inc., 1144 Wilmette Avenue, Wilmette, IL 60091.

American Gas Association, Dept. I-14, 1515 Wilson Blvd., Arlington, VA 22209, furnishes free 35 mm filmstrips. NATURAL GAS--SCIENCE BEHIND YOUR BURNER shows how gas gets from well to burner and comes with wall charts and worksheets. Other titles include, FUEL CELLS, HOW THE JET ENGINE WORKS, LOOK TO THE FUTURE, MORE TO COME (estimates of energy resources underground), SCIENTISTS WORK TOGETHER (case study of a fuel cell research project). Free films for teachers are available from the same source. ENERGY traces sources from the first fires to atomic power, outlines problems and proposes some solutions.

Association Films, Inc., 866 Third Avenue, New York, NY 10022 lends 16 mm movies free of charge. Examples of titles are MIRRORS OF TIME about a research ship exploring the ocean floor in search of gas and oil deposits; THE ENERGY BRIDGE about coal's potential to bridge the fuel resource gap; KING ZOB AND THE ENERGY CRUNCH about space heating and cooling conservation possibilities; UNSEEN JOURNEY about transporting crude petroleum.

BATE'S CAR: SWEET AS A NUT. 16 minutes, 16 mm, color, $230 or $30-rent, 1975 (grades 5-12). Arthur Mokin Productions, 17 W. 60th Street, New York, NY 10023. Presents the inventor's energy-saving inventions, particularly his methane-driven automobile. Highly recommended by AAAS.

COALMINING: THE STORY OF BURIED SUNLIGHT. Filmstrip #1, Part A, elementary, grade 5. Available through the local AEA.

Citizens' Energy Project, COMMUNITY SELF-RELIANCE POSTER, 1979, $4, from Citizens' Energy Project, 1413 K Street, 8th Floor, Washington, DC 20005. This colorful graphic displays a self-reliant community basking under the sun. Rehabilitated homes, bike paths, urban gardens, greenhouses, and a community health clinic are featured projects. Flip side lists resource people and other information.

CONSERVE YOUR ENERGY, a family energy diet kit (includes booklet, score card, poster) is available for $2 from Associated Press, 50 Rockefeller Plaza, New York, NY 10020.

C.U.R.E. (Citizens United for Responsible Energy) produced SOLAR ENERGY IN IOWA, a 22-minute slide show in 1977 which covers the basic principles of solar as well as projects in and near Iowa. A cassette and script is included. Rental for contribution from C.U.R.E., 3500 Kingman Blvd., Des Moines, IA 50312. 515/277-0253.

DOE Technical Information Center Film Library, P.O. Box 62, Oak Ridge, TN 37830, provides teachers with an annotated brochure on free energy films for classroom use. Write for your copy. Some titles that Iowa teachers have used and liked are LOOK TO THE SUN; SUN POWER FOR FARMS; THE ULTIMATE ENERGY and TO BOTTLE THE SUN (on fusion's potential); PUTTING THE SUN TO WORK (showing an innovative home); ENERGY, THE AMERICAN EXPERIENCE (which illustrates the historical relationship between economic growth, industry, and energy sources); CHALLENGE OF THE FUTURE; ON THE MOVE (about packing and shipping radioactive materials); POWER FROM THE EARTH (concerning geothermal energy); UP THE POWER CURVE, on conservation, covers a wide range of energy-saving ideas and estimates and savings from each; WORLD BEHIND YOUR LIGHT SWITCH tells in a non-technical way the story of production, transmission, and use of electricity.

ECOLOGY ACTIVITY CARDS are available from: BFA Educational Media, 2211 Michigan Avenue, Santa Monica, CA 90404. Some of the activities are related specifically to energy. Others in the box guide the children towards conservation and the idea of using our resources wisely.

ECOLOGY: UNDERSTANDING THE CRISIS is available from: Series No. 6454, c. 1972. Encyclopedia Britannica Educational Corporation, 425 North Michigan Avenue, Chicago, IL 60611. Filmstrip, records, guides generally cover what has caused the crisis, how man relates to his environment, plus a look into the future.

ENERGY: A FIRST FILM. 8 minutes, sound, color (grades K-3), BFA Educational Media, 2211 Michigan Avenue, Santa Monica, CA 90404.

ENERGY: ABILITY TO DO WORK. 9 minutes, color, sound (grades 5-8), AIMS Instructional Media Service, P.O. Box 1010, Hollywood, CA 90028.

ENERGY ALTERNATIVE OR FUTURE SOURCES OF ENERGY. Filmstrip #2, elementary grade 6. Available through the local AEA.

ENERGY AND ITS FORMS. U 25547, CORF-1961, 11 min. b/w, $5.60. Explains the basic concept of energy and shows examples of its principal forms, including nuclear energy. Introduces the idea of changing energy from one form to another to do work, and outlines the way in which plants convert the energy of the sun to chemical energy to provide a basic source of food and fuel. See "Iowa Films" listing for ordering information.

ENERGY AND WORK. US 25685, EBEC-1962, 11 min., color, $6.80. Explains through simple experiments that energy is neither created nor destroyed, but simply changed from one form to another. Illustrates a variety of these transformations and explains them in simple terms. See "Iowa Films" listing for ordering information.

THE ENERGY CHALLENGE - Kit, c. 1975. Pollution Control Education Center, Township of Union Public Schools, Union, NJ. Grade level undesignated, however, could be used in grade 6 with some modification and for the junior high. Contains student booklets, teacher's guide, two filmstrips with cassette, duplicating masters, activity cards, and overhead transparencies.

ENERGY CRISIS. U 30217, JOU-1972, 12 min., color, $8.30. Reviews our sources of energy and the length of time they may remain available. A hydro-electric plant, a conventional steamdrive electrical power plant and a nuclear power plant display how each generates power and its limitations. Concludes with possible solutions such as the "Fast Breeder Reactor" and "Fusion Reactor" which may someday provide unlimited power. See "Iowa Films" listing for ordering information.

ENERGY CRISIS GAME. 1973 (Upper elementary and junior high), Intemation, Inc., New York, NY 10001. For 2-6 players.

ENERGY DOES WORK. U 25548, CORF-1961, 11 min., b/w, $5.60. Billy, surprised to learn that when he is playing, he is doing work, is shown, by means of examples intended to appeal to the young child, that work is done whenever something is moved, that energy can be stored, and that food supplies energy to our bodies. See "Iowa Films" listing for ordering information.

ENERGY GAME. Northern Natural Gas produced a twenty minute slide-tape show followed by a quiz, designed for grades 4-6. The stress is upon energy conservation with a short review of where energy comes from. The kit is available through Northern Natural Gas, 503 Shops Bldg., Des Moines, IA 50309. 515/288-7463. No charge.

ENERGY HISTORY OF THE UNITED STATES 1776-1976 is a large, colorful wall poster for classroom use. Cost: $2.05 from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, Stock No. 052-010-00468-0.

ENERGY IN IOWA. Filmstrip #1, Part B, elementary grade 5. Available through the local AEA.

ENERGY: PAST AND PRESENT, and ENERGY: FUTURE SUPPLY AND COSTS are slide-tape sets available free from Iowa State Extension Service. Call the county extension office to borrow copies.

ENERGY WITH A CAPITAL C - FOR CONSERVATION. Energy Policy Council, 707 East Locust, Des Moines, IA 50319. Slide presentation comes complete with slides, audience pamphlets, and a recorded cassette of the slide narrative.

FIRST FILM ON THE WIND. 9 minutes, 16mm, color, sound, c. 1966, (Elementary), BFA Educational Media, 2211 Michigan Avenue, Santa Monica, CA 90404. Shows how, though one cannot see the wind, he can see what the wind does, such as making waves on the water, swaying trees, and lifting kites. Shows how rain clouds come and go with the wind.

Iowa Films. Films listed as "Iowa Films" can be ordered by phone, by mail, or in person. (Collect calls accepted from Iowa.) Ask for film scheduling. The two locations of film centers are:

University of Iowa
Media Library
C-5 East Hall
Iowa City, IA 52242
319/353-5885
Hours: 8:00-5:00

Iowa State University
Media Resources Center
121 Pearson Hall
Ames, IA 50011
515/294-1540
Hours 7:30-12:00
1:00-5:00

Price list is the charge for three day rental. You are responsible for return postage. A written purchase order is required before shipment from the media resource person or business office of your school.

Iowa Energy Extension Service has several audio-visual resources available on energy conservation for no charge except return postage. Order from: Iowa Energy Extension Service, Iowa State University, 110 Marston Hall, Ames, IA 50011.

Films:

* THE GREAT ADVENTURE

A 30-minute color sound 16 mm production showing the potential for solar energy, emphasizing a variety of applications including

wind and the making of fuels from biomass products. Eddie Albert narrates. 1979. For general use. Produced by Department of Energy.

* A CITY FARMSTEAD

15 min., 16 mm color. Shows how one urban house uses solar, waste recycling and food production.

Slide Shows:

* PASSIVE SOLAR ENERGY

Six separate slide shows of 20 slides each on the following topics: general, direct gain, conservation aspects, thermal storage walls, attached greenhouses, water heating and roof ponds. Pictures and projects mostly from New Mexico. Developed by Dr. J. D. Balcomb. Script included.

* THE SOLAR QUEST

87 slides, 11 minutes, color. Documents how solar is being tapped for practical use in homes. Includes underground. Produced by The Polished Apple. Also available in filmstrip. Cassette tape accompanies. For general use.

* ENERGY FOR RURAL IOWA

20 minutes. Discusses research projects at Iowa State Univesity. #S851. Can be ordered through Media Resources. Includes wind, research house, alcohol, methane. Produced in 1979.

Living History Farms. SEEDS OF SURVIVAL, a 28-minute film portrays American farming of pioneers, and farmers in the 1900's and today. Energy reliance and sources are evident. The film is available for $3 from: The Grinnell Mutual Reinsurance Company, Public Relations Department, Grinnell, Iowa 50112; or Living History Farms, R.R. 1, 2600 NW 111th St., Des Moines, IA 50322.

MAN'S SEARCH FOR ENERGY. Filmstrip, 36 frames, $6.75, (grades 5-8), McGraw-Hill Films, 1220 Avenue of the Americas, New York, NY 10020.

Modern Talking Picture Service, 2323 Hyde Park Rd. New Hyde Park, NY 11042, offers a variety of free films produced by major industries as public relations/education efforts. Most of them are very professionally done; many are cinematic award winners. Write to the above address for their free lists. (Films are shipped from the Modern Library in Cedar Rapids.) A few of their other energy-centered movies available to junior and senior high schools are: WITHIN THIS EARTH, A MATTER OF ENERGY, MINING AND THE ENVIRONMENT, ENERGY VS. ECOLOGY, THE GREAT DEBATE, NUCLEAR ENERGY FOR TODAY AND TOMORROW, OFFSHORE, REFINERY, ENERGY IN PERSPECTIVE.

THE PETRIFIED RIVER. Film available from Iowa Electric Light Company.

RHR Filmedia, Inc., 1212 Avenue of the Americas, New York, NY 10036 will lend (free) the 16 mm color film, A QUESTION OF VALUES. This is the story of a small town's intense debate over potential benefits and dangers of a new oil refinery. Also, free on loan from the same source, THE HIDDEN ENERGY CRISIS explains that energy shortages may reduce supplies of petrochemicals commonly used in clothing, shelter, and food, and DOUBLE UP AMERICA explains benefits of carpooling.

Rienow, Robert. DARKNESS FOR OUR CITIES is an audiotaped plea for wasteful Americans to change their ways. It would be a useful introduction to an energy or conservation unit. Students will hear many possibilities for further research. Available for $14.95 from Center for Cassette Studies, Inc., 8110 Webb Avenue, North Hollywood, CA 91605.

Shell Oil Company Film Library, 1433 Sablier Circle West Drive, Indianapolis, IN 46239 will send you a list of films available on free loan. Some energy-related offerings are: THE FOSSIL STORY which emphasizes significance of fossils in the search for oil deposits; THIS LAND which explores the natural resources of North America, including oil and coal, and how they were formed; OIL, OIL WELL, and REFINERY PROCESSES which depict the source and processing of American's favorite fuel; and FOOD OR FAMINE which illustrates methods of improving agriculture around the world.

Union Carbide Corporation, Public Affairs, 1730 Pennsylvania Avenue NW, Washington, DC 20006 will provide a free wall chart listing nearly 500 NON-FUEL USES FOR OIL.

U.S. Department of Commerce, Office of Energy Programs, Room 3011, Washington, DC 20230 will lend (free) the 16 mm color film on ENERGY: CRITICAL CHOICES AHEAD, a discussion of energy supply and demand through the year 2000.

ORGANIZATIONS AND RESOURCES

If you have the energy to write a few letters on school stationery, the following organizations will fill your mailbox with free or low-cost information on energy topics.

American Gas Association, 1515 Wilson Blvd., Arlington, VA 22209 has an energy newsletter, films, ditto masters, and a variety of free literature free to teachers who request them on school stationery.

American Petroleum Institute, Information Service Department, 2101 L Street NW, Washington, DC 20006 provides an abundance of colorful materials for classroom use, free on request, including movie loans.

American Public Gas Association, Watergate Office Bldg., 2600 Virginia Ave. NW, Washington, DC 20037 provides free educational materials on request.

American Wind Energy Association, 1621 Connecticut Avenue NW, Washington, DC 20009 will send a brochure of general information about windmills, an invitation to join the club, and a list of publications available on the subject of wind machines.

Area Education Agency (AEA) has films, filmstrips, book catalogs and other resources for energy education. Contact the nearest one.

Association of Home Appliance Manufacturers, 200 N. Wacker Drive, Chicago, IL 60606 provides free "Energy Data" on typical operational costs of home appliances.

Atomic Industrial Forum, Public Relations Department, 7101 Wisconsin Avenue, Bethesda, MD 20014 will send information on nuclear power plants, including black-and-white graphics (for easy reproduction) diagramming various types of reactors.

Chamber of Commerce may be able to help locate solar buildings, alternative energy-related businesses, knowledgeable members of the community who may cooperate on an energy project for the class.

Citizens' Energy Project, 1110 - 6th St., NW, #300, 8th floor, Washington, DC 20001 researches and publishes comprehensive, low-cost reports on dozens of energy resources. Write for current list of titles.

Citizens United for Responsible Energy (CURE) 3500 Kingman Blvd., Des Moines, IA 50311, Tel. 515/277-0253, maintains a roster of speakers on energy topics and publishes a newsletter that often features "solar successes."

Cooperative Extension Service, 110 Curtis Hall, Iowa State University, Ames, IA 50011 has many bulletins and pamphlets on energy conservation available for the asking. Write or call 515/294-4576.

Edison Electric Institute, Public Relations Department, 90 Park Avenue, New York, NY 10016, provides information on all forms of electrical generation and a series of useful handbooks of energy-related experiments for the classroom.

Energy and Education Action Center, Room 514, Reporters Building, 300-7th St. SW, Washington, DC 20202, serves as an information center and data distribution network centered on energy-education materials and conservation measures.

Energy Extension Service, 110 Marston Hall, Iowa State University, Ames, IA 50011, has information and programs for schools and communities. Write or call 515/294-4266 for an up-to-date list of services.

Energy Research and Information Foundation, 3500 Kingman Blvd., Des Moines, IA 50311. ERIF is a non-profit corporation to promote and conduct research and educational projects as well as to provide information. Programs include Energy Sources, Kill-A-Watt, and a Traveling Solar Display. Phone: 515/277-0968.

Environmental Action Foundation, The Dupont Circle Bldg., Suite 724, Washington, DC 20036 will send a resource guide on electric utility issues.

Environmentalists for Full Employment, 1101 Vermont Ave N.W. #305, Washington, DC 20005 has published Jobs and Energy ($2 for individuals) and Jobs and Energy Update (50 cents each), exploring the impact of energy use transitions and alternative energy sources on employment. They advocate conservation and diverse solar systems as the best answers to the related problems of unemployment and the capital drain made by corporate energy industries.

Ethyl Corporation produces an annual Ethyl Digest on an energy topic. Get a free copy by writing to Ethyl, Corporate Public Relations, 330 South Fourth St., Richmond, VA 23217.

Ideas and Information Center, Iowa-Illinois Gas and Electric Company, 1403 Kimberly Road, Bettendorf, IA 52722. Phone 319/326-7054. Educational materials and answers to specific questions on local utility rates, consumption patterns, and insulation guidelines.

Institute for Local Self-Reliance, 1717 - 18th St. NW, Washington, DC 20009. This non-profit educational and research group explores possibilities of urban communities becoming productive, self-reliant systems. Write for their list of publications on topics like "A Neighborhood Energy/Food/Waste System," "Dawning of Solar Cells," "Neighborhood Power," and various food production concerns.

International Solar Energy Society, American Section, 12441 Parklawn Drive, Rockville, MD 20852 maintains a bibliography of solar and other renewable energy sources.

Iowa Academy of Science, University of Northern Iowa, Cedar Falls, IA 50613 publishes the quarterly Iowa Science Teachers Journal.

The April 1979 issue featured several energy-education articles including "Wind Energy in Iowa." This one issue is available free to science teachers using school stationery for their request to the Editor, ISTJ. Subscription rate is $4/year.

Iowa Center for Local Self-Reliance, 3500 Kingman Blvd., Des Moines, IA 50311. The center is trying to research, demonstrate and educate the public about technologies and social structures which lead to self-reliance such as solar energy, energy conservation, organic gardening, recycling, and water conservation. Demonstrations, pamphlets, programs and consultations are offered. Phone: 515/277-0968.

Iowa Energy Policy Council, Lucas Bldg., Capitol Complex, Des Moines, IA 50319 has up-to-date information on energy use in Iowa and booklets on a variety of energy topics. Hotline: 515/281-4306.

Iowa Solar Office, Iowa Energy Policy Council, Capitol Complex, Des Moines, IA 50319 has solar energy information and materials including publications, films, a speakers bureau, consumer materials and lists of Iowa solar businesses and architects. Phone: 800/532-1114.

Iowa Solar Energy Association, 1433 Wildwood Drive, Cedar Rapids, IA 52402, 319/365-6103 may be able to provide you with resource persons who are knowledgeable about solar technology.

League of American Wheelman, 19 S. Bothwell, Palatine, IL 60067 provides information on ways and means of improving conditions for bicycling.

League of Women Voters of the United States, 1730 M Street NW, Washington, DC 20036 has a catalog of their own free or low-cost energy publications. Revised annually, this catalog is available from "Energy Department Publications" at the above address.

National Coal Association, 1130 Seventeenth Street NW, Washington, DC 20036, has articles, booklets, films, and other aids available on request that discuss the past, present, and future of coal.

National LP-Gas Association, 1800 North Kent St., Suite 1004, Arlington, VA 22209, provides free information about their products.

National Petroleum Council, Director of Information, 1625 K Street NW, Suite 601, Washington, DC 20006, provides free literature on various aspects of getting and using petroleum.

National Science Teachers Association, 1724 Connecticut Ave., NW, Washington, DC 20036 will send any teacher their bimonthly newsletter Energy and Education (free) plus a list of other energy publications.

National Solar Heating and Cooling Information Center, P.O. Box 1607, Rockville, MD 20850 publishes many handsome no-cost brochures and books, like "Passive Design Ideas for the Energy Conscious Consumer." You can call this group toll-free at (800) 523-2929.

National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 sells reprints of many otherwise-difficult-to-locate publications on a wide variety of energy topics. Write for a free list of publications.

National Wildlife Federation, 1412 - 16th St. NW, Washington, DC 20036 nas conservation education publications and selected resource materials for developing energy education programs.

Public Interest Research Group, P.O. Box 19312, Washington, DC 20036 can provide information on Energy Alternatives.

Shell Educational Services, Shell Oil Company, P.O. Box 2463, Room 1541, One Shell Plaza, Houston, TX 77001 can provide energy education materials.

Sierra Club, Information Services, 1050 Mills Tower, San Francisco, CA 94104 will provide an Energy Packet for $1. This collection of articles includes "Solar Energy Now," and "Geothermal Energy" among several others.

U.S. Government Printing Office, Washington, DC 20402, offers many energy-related publications at prices from $1 to $10. Write to the above address and ask for Subject Bibliography Index and Price List 36 which contain information for selecting materials pertinent to energy-environmental issues.

Utility and/or Power Companies often have pamphlets and filmstrips, and sometimes posters, games, and lesson plans available to teachers.

Volunteers in Technical Assistance (VITA), 3706 Rhode Island Ave., Mt. Rainier, MD 20822 publishes technical bulletins on do-it-yourself technology including solar, hydro, and wind-powered projects. Bulletins are well illustrated, clearly written, and range in price from $1 to $6. Write for a free list of titles.